UNHOLTZ-DICKIE CORPORATION

vibration generation systems and measurement instruments

MODEL ACS-6

ACCELERATION CONTROL SELECTOR

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OPERATING AND SERVICING INSTRUCTIONS

UNHOLTZ-DICKIE MODEL ACS SERIES

ACCELERATION CONTROL SELECTOR

MODEL ACS-6

SERIAL NO. 127

Unholtz-Dickie Corporation
2994 Whitney Avenue
Hamden, Connecticut 06518

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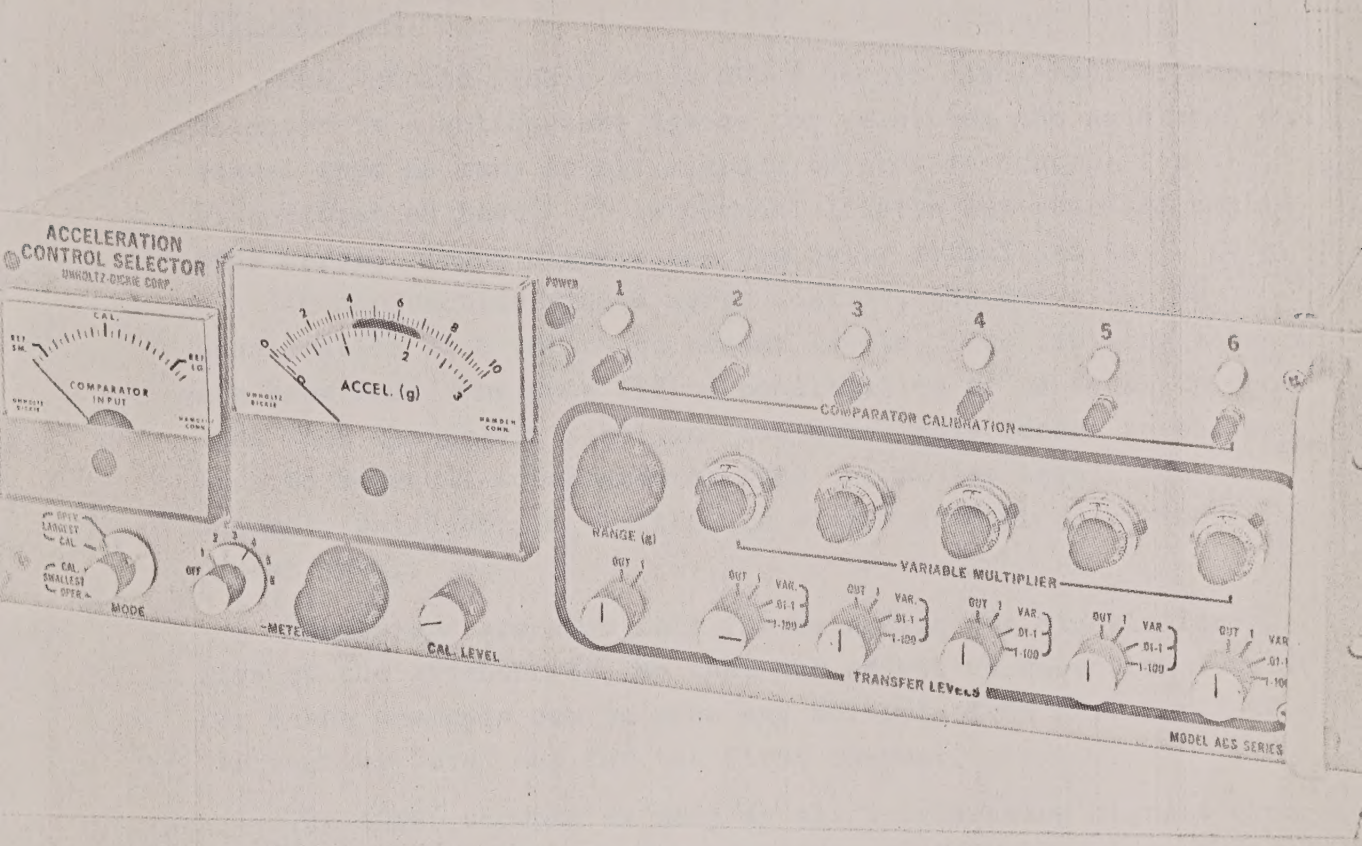


Features

- Selects either the largest or smallest of six acceleration signals
- Variable weighting for having independent selection levels for each channel
- Detection time varies continuously with frequency and is as fast or faster than closed-loop servo response time
- Visual indication of control channel
- Provisions for accurately presetting the selection or switching levels
- Switch interlock circuitry in the event of operator error
- Large, accurate vibration meter with single-ended dc output
- All solid state signal switching

1. INTRODUCTION

The Unholtz-Dickie Model ACS-6 Series Acceleration Control Selector is a solid-state device for selecting one acceleration signal from as many as six signals to provide control for a sine-vibration test. It is compatible with any standard amplitude servo. Input signals are typically normalized to 10 mV/g.

In conjunction with a servo control, the ACS-6 limits acceleration at 6 points to preset levels. Two limiting modes are provided. One mode limits acceleration to be equal to or less than the preset level and the other mode forces acceleration to be equal to or greater than the preset level. One channel, whichever is limitng, is always maintained at the preset level.

Provisions are also made for weighting the signals for five of the six channels, so that the effective selection levels for these channels can be made any multiple from X .01 to X 10.0 the control level set for the first channel.

The ACS-6 accepts as many as six acceleration signals from standard signal-conditioning amplifiers. Each is weighted according to the front panel control settings and is applied to a six-channel gate circuit. Each weighted input voltage is also converted to a dc voltage which is presented to a six-channel comparator circuit. The comparator circuit then triggers the gate associated with the largest (or the smallest) signal presented. A light indicates the active or gated signal channel. The desired input acceleration is thereby gated to the servo for control purposes.

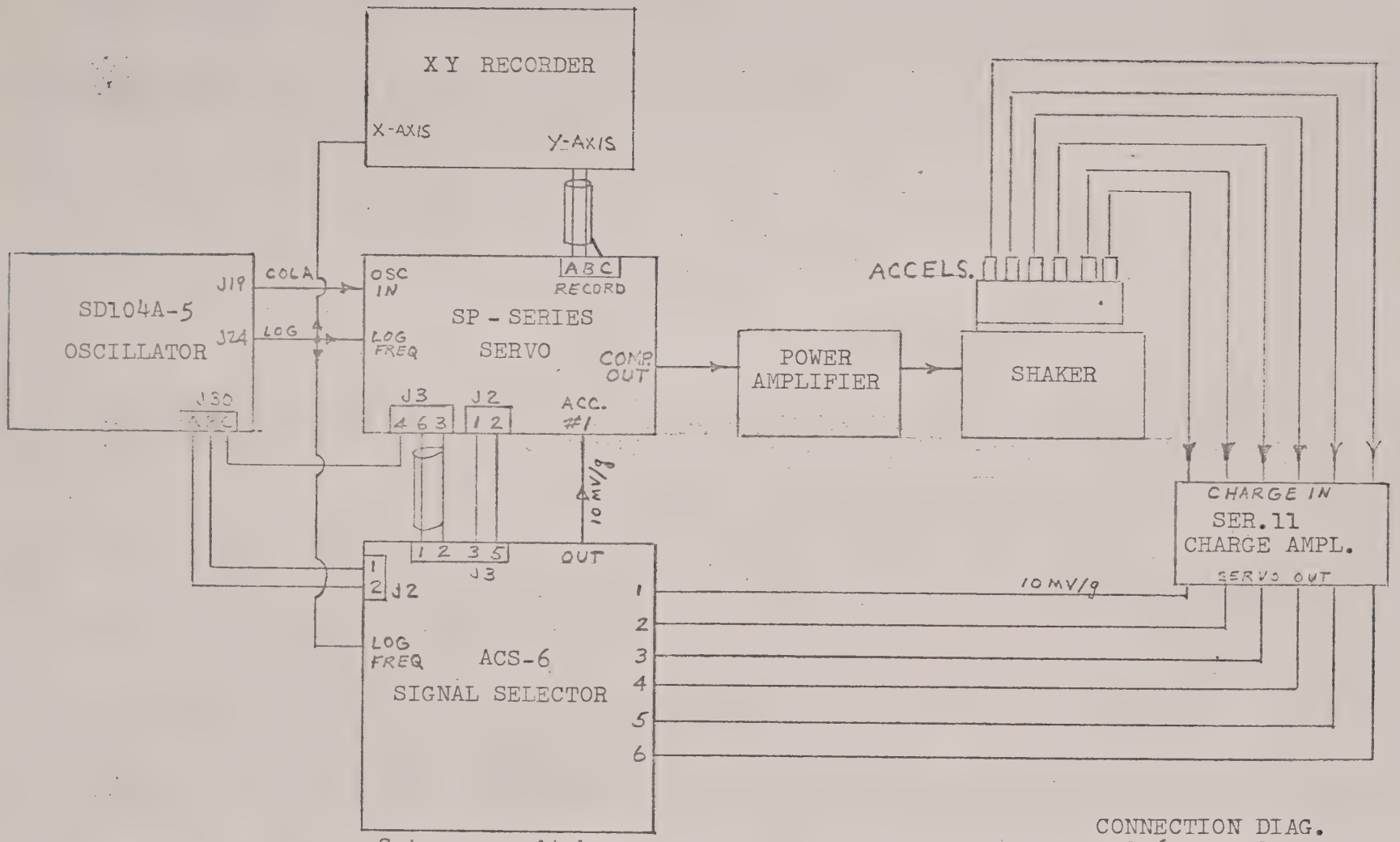
A d-c voltage from the sweep oscillator which is proportional to log frequency is used to control the filter time constant of the AC-DC converters in the ACS-6. The time constant so obtained is very nearly equal to the closed-loop response time of a servo which has 10 dB/sec (compressor speed at 5 Hz increasing to 3000 dB/sec at 5 kHz. Thus, the inputs to the comparator circuit follow the dynamic changes of the amplitudes of the

sine accelerations as well or better than the servo can follow the dynamic gain changes of the control channel.

For purposes of calibrating and presetting the comparator circuit, a front panel switch inserts a variable-amplitude power frequency signal to all acceleration inputs. This enables the front panel controls to be completely adjusted prior to the actual test. In the calibration mode the servo is automatically kept in a standby or fully compressed condition.

Furthermore, if an attempt is made to change any switch setting inside the TRANSFER LEVELS rectangle while an actual vibration test is being carried out, the ACS-6 will automatically return the servo to the standby or fully compressed condition.

All signal switching is accomplished by solid-state devices. The circuitry is located on printed-circuit plug-in cards for reliability, accessibility and ease of maintenance. Block diagrams of ACS-6 setups with various compatible equipment are included in Fig. 1-1 through Fig. 1-4. The ACS-6 will operate with Unholtz-Dickie, B & K, Ling and Spectral Dynamics servo equipment. Also, it is possible to gang two ACS-6 units together to provide 11 selection channels as shown in Fig. 1-5.



Set rear switches to "AUTO" and "EXT"

CONNECTION DIAG. ACS-6 WITH SP SERIES SERVO

FIG. 1-1

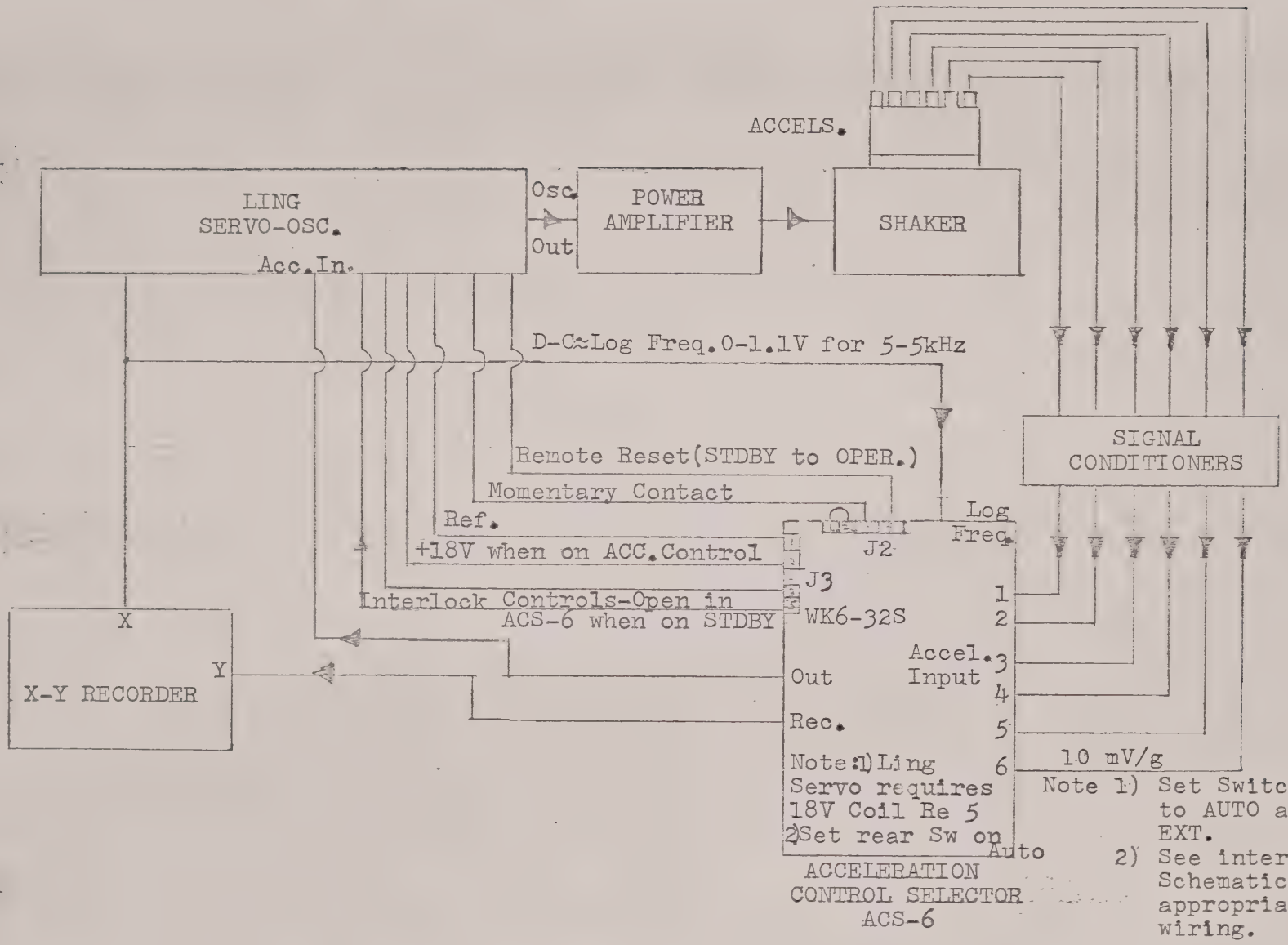


FIG. 1-2

TYPICAL TEST SETUP - LING SERVO OSC.

Rev. 8-69

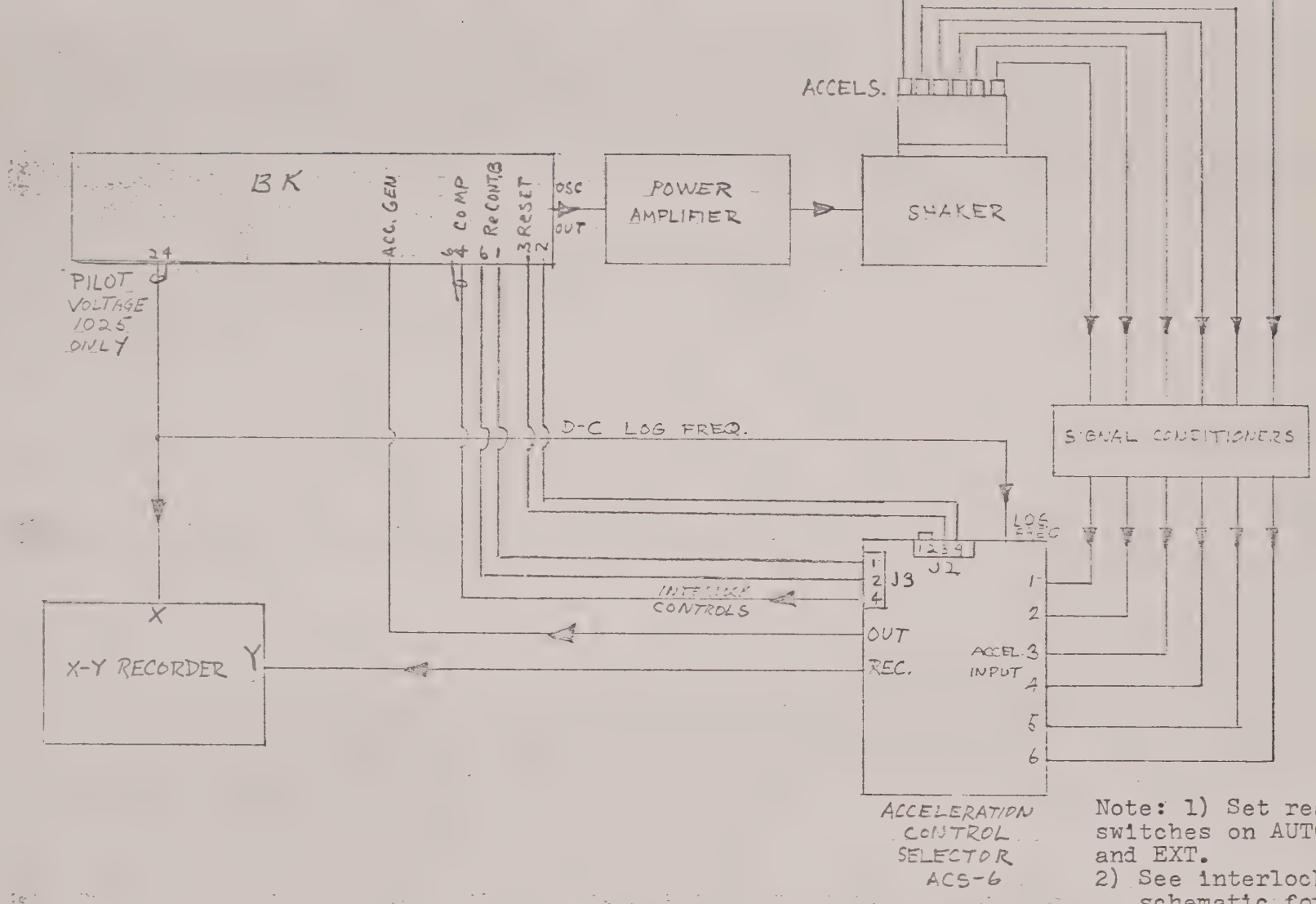


FIG. 1-3

TYPICAL TEST SETUP - BK SERVO

Note: 1) Set rear switches on AUTO and EXT.
2) See interlock schematic for appropriate wiring for BK servo.
3) See Page 9 for Instrument & Setting with use with BK

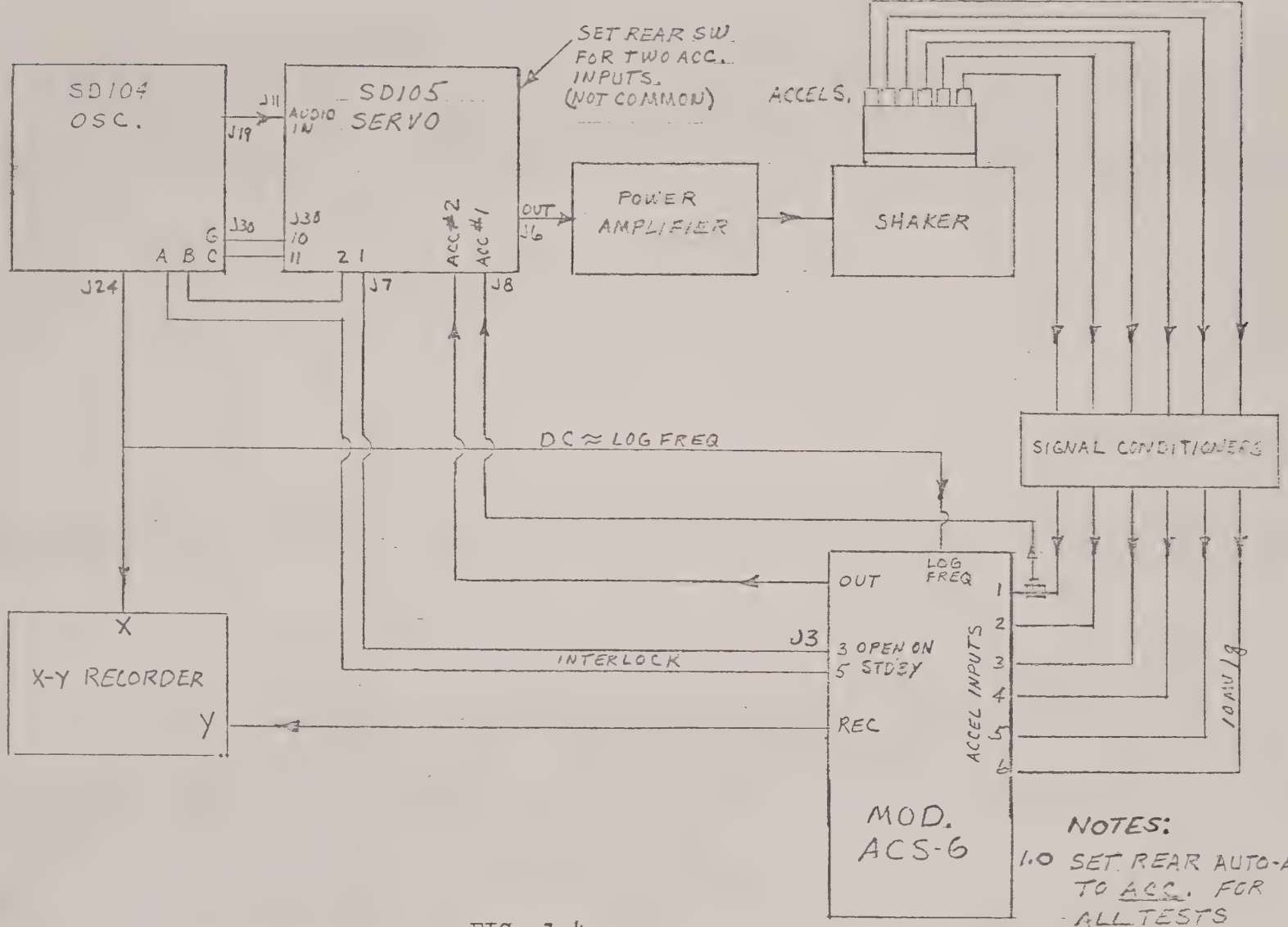


FIG. 1-4

TYPICAL TEST SETUP MODEL ACS-6, SD104, SD105

NOTES:

1.0 SET REAR AUTO-ACC TO ACC. FOR ALL TESTS

2.0 JUMPER PINS 1 AND 2 IN J2.

3.0 SEE INTERLOCK SCHEM. FOR APPLICABLE WIRING.

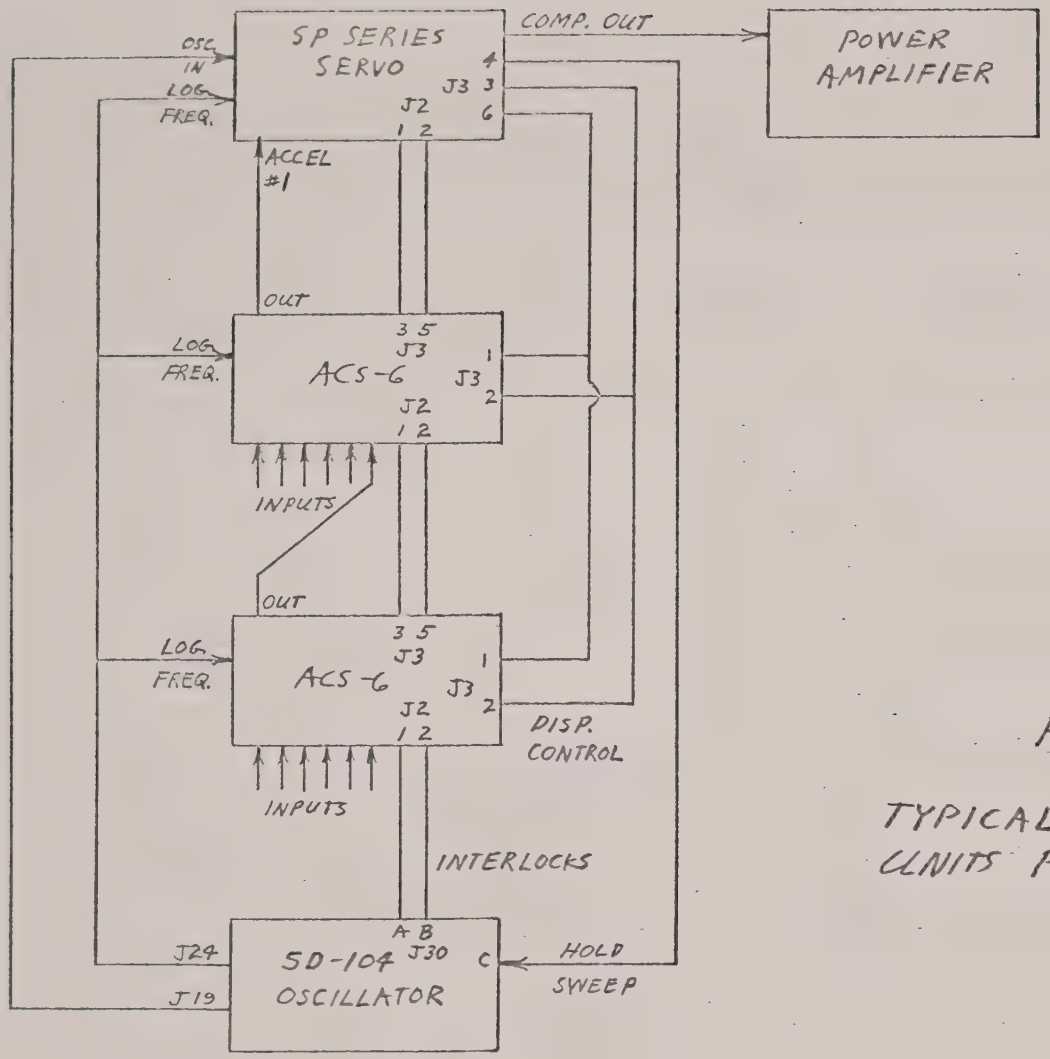


FIG. 1-5

TYPICAL SETUP WITH TWO ACS-6 UNITS PROVIDING 11 CHANNELS

2. DESCRIPTION OF CONTROLS AND CONNECTORS

2.1 The red POWER light goes on when power is applied to the ACS-6 through the line cord. There is no switch so the instrument cannot be turned off inadvertently. If the POWER light does not turn on, but the chassis fan does operate, the 5.5V relay power supply should be checked, since the light derives its power from this supply.

2.2 Two different interlock connections are available. See interlock schematic. When wired for servos other than BK 1025, 1019, the yellow STANDBY light comes on only when in either CAL mode. When wired for BK servos, the yellow STANDBY light goes on if the instrument is plugged in while the MODE switch is in either OPER. mode. To turn it off and reset the interlock circuit, return the MODE switch to either CAL position and then to the OPER. mode. If the position of any switch within the TRANSFER LEVELS rectangle is changed when the MODE switch is in either OPER. condition, the STANDBY light goes on. For use with B&K servos a negative voltage is applied to the compressor section whenever the STANDBY light is on.

2.3 The MODE switch has four positions, each of which is described below:

2.3.1 OPERATE-LARGEST: The largest of the weighted signals applied to the ACCEL inputs is gated to the OUTPUT. As a signal increases in amplitude for a particular channel selected by the METER SELECTOR, the meter indication on the COMPARATOR INPUT moves from right to left (downscale).

2.3.2 CALIBRATE-LARGEST: A power-frequency signal of adjustable amplitude is fed to all acceleration inputs. The ACCELERATION meter indicates the amplitude of this signal and adjustment of other front panel controls allows complete presetting of the switching levels for operation in the LARGEST selection mode.

2.3.3 CALIBRATE-SMALLEST: Same description as 2.3.2. except that presetting is accomplished for operation in the SMALLEST selection mode.

2.3.4 OPERATE-SMALLEST: The smallest of the weighted signals applied to the ACCEL input is gated to the OUTPUT. An increase in signal amplitude causes the COMPARATOR INPUT indication to move from left to right (upscale).

2.4 The METER SELECTOR switch is located to the right of the MODE switch. It allows the ACCEL (g) meter to monitor the amplitude of the acceleration of the indicated channel, and allows the COMPARATOR INPUT meter to monitor the voltage presented to the comparator circuit by the channel indicated.

2.5 The COMPARATOR INPUT meter is buffered by an emitter follower to prevent loading of the comparator input circuit. With zero input signal, and the MODE switch in either OPER or CAL LARGEST position, the indication should be REF. LG. (at right). With zero input for the OPER. or CAL. SMALLEST positions, the indication should be REF. SM. (at left). For optimum operation, channel switching should be accomplished for signals large enough to cause an indication at or near the CAL. mark.

2.6 The METER RANGE switch selects the full-scale range of the ACCEL. meter. This switch is not interlocked in the OPER. modes since it provides a monitoring function only.

2.7 The CAL. LEVEL potentiometer derives a power frequency voltage from the power transformer and applies it to all six ACCEL inputs simultaneously in either CAL. mode. In the CAL. modes the external inputs are disconnected. The CAL. LEVEL control has a logarithmic characteristic so that acceleration levels from 0.3 g to 1000 g can be simulated.

2.8 The COMPARATOR RANGE switch is located inside the rectangle in the channel 1 position. It gives the maximum value for the switching level for channel 1 and a related value for the switching levels for the remainder of the channels.

2.9 The MULTIPLIER switches are located inside the rectangle. In the OUT position the channel is inactive, the input is grounded and the COMPARATOR input is held at the REF. LG. position to prohibit switching to the inactive channel.

The UNITY (1) position indicates that the weighting of the input signal is unity (gain is unity) and that the switching level is the same as that set for Channel 1 (the control channel).

The VARIABLE positions of the MULTIPLIER switch for channels 2 through 6 indicate the ranges over which the switching level of Channel 1 may be multiplied in order to obtain the switching level of the indicated channel. The .01 - 1 range indicates a multiplier from .01 to 1 and a corresponding gain range of the input amplifier from 100 to 1. The 1 - 10 range indicates the level multiplication factor and a corresponding gain range for the input amplifier of 1 to 0.1.

The multiplier range less than unity would have application for limiting cross-axis motion, since cross-axis motion is generally smaller (or should be) than that in the primary control channel. The multiplier range greater than unity would have application for limiting the acceleration of resonant points on the specimen, since magnification factors much greater than unity relative to the control point are often realized.

2.10 The VARIABLE MULTIPLIER controls for Channels 2 through 6 are precision ten-turn potentiometers, the dials of which are offset slightly less than 0.1 turn. The dial setting gives a precision indication of the multiplier for each multiplier gain range. The table below summarizes this information.

MULTIPLIER RANGE	MULTIPLIER	GAIN VAR. GAIN AMP.
1	dial not active	1
.01 - 1	0.1 x (dial setting)	$\frac{10}{\text{(dial setting)}}$
1 - 10	1.0 x (dial setting)	$\frac{1}{\text{(dial setting)}}$

2.11 The COMPARATOR CALIBRATION potentiometers normalize the outputs of each AC-DC converter circuit. The adjustment is made so that acceleration signals equal to the desired selection levels in each channel give identical deflections (to the CAL mark) on the COMPARATOR INPUT METER.

2.12 The CHANNEL INDICATOR lights (white) indicate which channel input is being gated to the output.

2.13 Rear Chassis Connectors and Controls

2.13.1 The ACCEL inputs are provided by six insulated BNC connectors near the bottom edge of the chassis. These accept signals from commercial signal conditioners at a sensitivity of 10 mV/g.

2.13.2 The OUTPUT connector (insulated BNC) supplies the weighted and gated input signal to the acceleration input of the servo. The sensitivity of the output signal is 10 mV/g if the channel multiplier (sec. 2.9 and 2.10) is unity. For other mulitplier values (channels 2 through 6) the output signal sensitivity is 10/multiplier mV/g. The output sensitivity for the channel 1 signal when gated to the output is thus always 10 mV/g.

2.13.3 The LOG FREQ. input connector (insulated BNC) accepts a DC signal proportional to the logarithm of the signal frequency. This signal is generally obtained from the sweep oscillator. The ACS-6 has provisions for accepting either positive-going or negative-going signals up to a maximum value of 10V at 5 kHz. The voltage should be nearly zero at 5 Hz.

2.13.4 The FOUR-POSITION SWITCH to the left of J3 allows the type of inputs suggested in 2.13.3 to be accommodated. A summary appears in the table below:

2.13.4 (continued)

SW. Pos.	ALLOWABLE INPUT VOLTAGE	INSTRUMENT AND SETTING
1	0 to 1.2V	SD104A-5 Freq. Mult. x 1 (5 to 5000 Hz) SD104A-1 Freq. Mult. x 10 (10 to 10,000 Hz)
2	0 to 1.2V	SD104A-5 Freq. Mult. x 0.1 (.5 to 500 Hz) SD104A-1 Freq. Mult. x 1.0 (1 to 1000 Hz)
3	0 to +10V	BK 1018, 1019, 1025 with positive log freq outputs Unholtz-Dickie LFC-5 (0 to 3V) Adjust Potentiometer for +1.2V DC at J 4 for 5 kHz input
4	0 to -10V	BK 1025 with standard negative log-freq. output Adjust Potentiometer for +1.2V DC at J4 for 5 kHz input

The adjustability in switch positions 3 and 4 is provided by a TRIMPOT located to the left of the switch. A test point is available at J 4 to allow the potentiometer to be adjusted properly.

In all cases, the ACS-6 is calibrated so that 0 volts appearing at the test jack corresponds to 5/10 Hz and +1.2 volt corresponds to 5/10 kHz. For use with the BK 1018, 1019 or 1025 or the U-D LFC-5, the potentiometer should be adjusted so that the voltage-frequency relation at the test jack is satisfied.

2.13.5 The RECORDER connector (insulated BNC) provides a single-ended DC voltage proportional to the indication of the ACCEL meter. Full scale meter indication corresponds to +1.00V. The output impedance is 1K and the linearity is better than $\pm$ .005V.

Thus, the input signal for any channel may be recorded by means of the METER SELECTOR SWITCH.

2.13.6 The ACCEL-AUTO DA Switch allows the ACS-6 to be used for two segment programs (i.e. Displacement-Acceleration). Note that programs with multiple acceleration levels or more than one crossover cannot be accurately controlled with the ACS-6. Check the appropriate block diagram for the setting of this switch. When on "DISPL" control the acceleration input signals all decrease with frequency. The comparator circuits in the ACS-6 require one signal to be at or near the preset level for proper operation. Therefore, when on displacement control the comparator circuits must be bypassed, and one channel must be positively switched to the output. Re 5 is connected to the BK or SP Servo Programmer and energized whenever the Servo is on ACC. When Re 5 is de-energized (Disp. Control) Channel 1 is switched to the output by grounding Q_1 Bd. C via the ACC-Auto Switch.

In the ACCEL. position, the ACS-6 should only be used for a constant-acceleration program over the entire frequency range (selection levels are fixed), except when used with the SD105A as described in 2.13.6.1.

In the AUTO D-A position, a low-frequency displacement program may be added. For the constant-acceleration portion of the program, the ACS-6 will gate the input signals according to the preset switching levels and the MODE of operation. However, below the crossover frequency, control switches automatically to Channel 1 and a decrease in signal level due to the displacement program cannot cause spurious gating to another channel.

2.13.6.1 Displacement-Accel Tests with SD Servos

The ACS-6 may be bypassed when using an SD105 Servo Control by connecting per the appropriate diagram. This connection utilizes the two input connections to the SD and switching is done within the SD. For this connection the AUTO-ACC. switch should be set on ACC. for all tests.

2.13.7 The ACCESSORY connector has several functions;

Pins 1 and 2 are connected to a relay coil and accept the crossover logic from the Servo. The relay action causes the AUTO D-A operation described in 2.13.6. Pin 2 requires a positive signal.

Pins 3 and 5 provide contacts to place SP Servos or Spectral Dynamics Servos on Standby when ACS-6 is in Standby or Cal. Mode.

Pin 4 supplies -9V through 3.3 K whenever the ACS-6 is in a CAL mode or if the interlock has been actuated while in an OPER. mode. The voltage is applied to pin 4 of the COMPRESSOR jack in the BK 1018/1019/1025 to provide full compression of the servo.

2.13.8 The INTERLOCK connector provides connections for external interlock circuits. Pins 1 and 2 must be externally connected. Connection to external normally-closed contacts will provide interlock action whenever the external contacts are momentarily opened.

2.13.9 The INT-EXT switch provides a chassis connection for the signal reference when the switch is in the INT position. The INT position is normally used for bench checkout. The EXT. position is normally used in console operation where it is assumed that the signal reference and console frame are made common in some other instrument.

2.13.10 The FUSE is 1A for a 115V line and 0.5 A for a 230V line. Accommodation for a different line voltage is accomplished by changing the jumpers on a terminal strip inside the chassis near the fuse holder.

3. OPERATION

3.1 Connect instruments as shown in appropriate Fig. 1.1 to 1.4. Note that connections depend on the type servo being used. Fig. 1-1 shows connections for Unholtz-Dickie SP Series Servos, Fig. 1-2 for Ling Servo, Fig. 1-3 for BK1025 Servo. Fig. 1-4 for Spectral Dynamics 105A Servo.

3.2 Calibrate the output at test jack according to 2.13.3. and 2.13.4. Allow SD104 oscillator 1 to 2 hours warmup time if used.

3.3 Initial control settings are as follows:

MODE	- CAL (LARGEST or SMALLEST as desired)
METERS	- OFF and 1000 g
COMPARATOR RANGE	- 1000 g
MULTIPLIER RANGE	- All OUT
CAL LEVEL	- CCW

3.4 Make sure primary control signal is connected to Channel 1. From desired test specifications put METER RANGE switch and COMPARATOR RANGE Swithc on proper full-scale setting. For example, if the primary control level were 8 g, set full scale value at 10 g.

3.5 Set METER SELECTOR switch to Channel 1 and MULTIPLIER switch on Channel 1 to unity. Channel 1 light should be on, and COMPARATOR INPUT meter should be in the appropriate REF. position. If not, a fault in the instrument is indicated.

3.6 Turn CAL. LEVEL control CW until desired control level is indicated on the ACCEL meter. In the example above, an 8 g indication is required.

3.7 Adjust COMPARATOR CALIBRATION for Channel 1 until COMPARATOR INPUT meter indication is on CAL. Turn MULTIPLIER switch to OUT for Channel 1.

3.8 Switch multiplier switch on Channel 2 to unity. Switch meter selector to Channel 2. Leave the CAL. LEVEL control untouched, at the same level that was indicated in paragraph 3.6 above. In the above example, the meter will still read 8 g.

3.9 Adjust the COMPARATOR CALIBRATION for Channel 2 until COMPARATOR INPUT meter indication is on CAL. Turn multiple Switch to OUT for Channel 2.

3.10 Repeat procedure 3.9 for all remaining channels that will be used.

3.11 The instrument is now programmed for control by the largest signal for all accelerometers. The control is always at the same g level, 8 g in the example. To operate, switch the MODE switch to OPER. and put all channels on unity on the VARIABLE MULTIPLIER range switch.

If, however, it is desired to put a weighting factor into any of the Channels 2, 3, etc., so that they will take control at some unequal g level (other than 8 g in the example) additional steps are necessary as follows:

3.12 With the MODE switch still on CAL., put the range switch for all channels except Channel 2 on OUT. From the desired test specification select the appropriate range of the VARIABLE MULTIPLIER for Channel 2. In the example used above, where Channel 1 is controlling at 8 g, let us suppose that Channel 2 is to take over control if its level rises to 10 g. In this case, the appropriate range is 1-10 because the 8 g is multiplied by 1.25 to obtain 10 g.

3.13 Both Range Switches should be on 10 g. In the following steps <u>do not</u> disturb the setting of the COMPARATOR CALIBRATION which was done in Par. 3.9 above. Put the meter selector switch on Channel 2. Now adjust the CAL. LEVEL control until the meter reads 10 g, the level desired for Channel 2. Finally, turn the VARIABLE MULTIPLIER potentiometer (ten turn pot) for Channel 2 until the COMPARATOR INPUT meter is on CAL. In this example, the setting of the pot will be approximately 1.25, that is, the window will be at 1 and the dial will be at 25. This completes the setup for Channel 2.

3.14 As a further example, let us set Channel 3 to control if the level at accelerometer 3 rises to 16 g. Switch all channels to OUT except channel 3, which is switched to VAR. 1-10. Again, <u>do not</u> disturb the setting of Channel 3 COMPARATOR CALIBRATION. Next switch the METER range up

3.14 (continued)

to 30 g. Switch the meter selector switch to Channel 3. Adjust the CAL. LEVEL until the meter reads 16 g. Now adjust the VARIABLE MULTIPLIER ten turn pot until the COMPARATOR INPUT meter is on CAL. The pot window should be at 2 and the dial at approximately zero.

3.15 As a final example, let us set Channel 4 to control at 2 g. Note that this lower level is not normally used except where a channel is used to control cross axis motion.

Put all channels on OUT except Channel 4, which is switched to VAR. .01-1. The meter range is switched to 3 g. Adjust the CAL. LEVEL until the meter reads 2 g. With the meter selector on Channel 4, adjust the ten turn pot until the meter is on CAL. The pot should be indicating .25 (2 g is .25 of 8 g), with the window on 2 and the dial on 50.

3.16 Return MULTIPLIER Switch settings for Channels 1 through 6 to the proper ranges for the multiplier values required. All channels which are not being used should be put to the OUT position.

3.17 Put servo in PRESET mode. Return ACS-6 to appropriate OPER. mode. This is necessary to remove standby condition from servo. Set up control value on servo to be the same as that used in 3.4 through 3.6. Switch servo to STANDBY and turn up OUTPUT control. Switch to operate mode. The output level should come up and be controlled by one of the active channels. Start the sweep to begin the test.

3.18 As the frequency of the sine signal is swept throughout the operating range, note that the ACCEL level indicated by the meter on the servo is always the primary control value used in 3.4 to 3.6 regardless of which channel is in control and regardless of the multiplier factor.

The vibration meter on the servo always reads the correct acceleration for channel 1, and reads the correct acceleration for the remainder of the channels (when gated to the ACS-6 output) only when the MULTIPLIER is unity.

3.18 (continued)

For all other MULTIPLIER values the actual acceleration is related to the indicated value on the servo by

actual value (g) = MULTIPLIER x indicated value

3.19 CAUTION

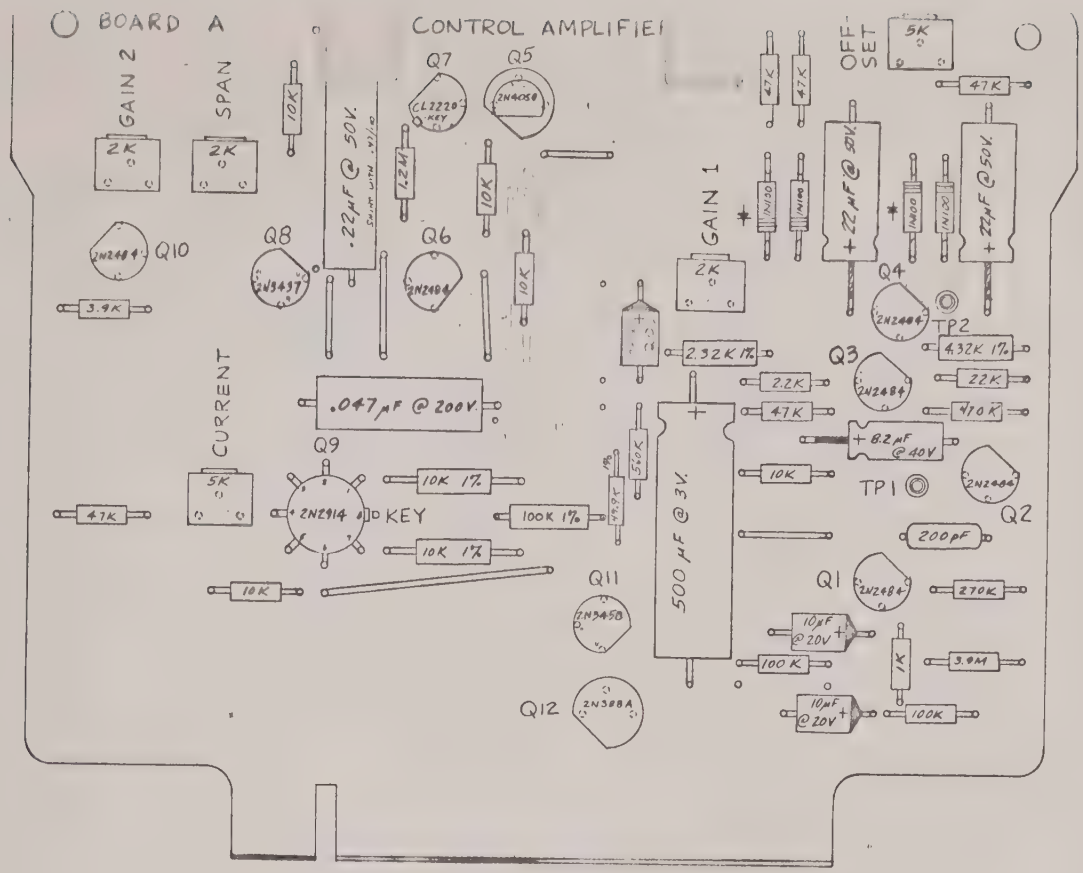
Channel 1 must always have a proper acceleration input for any test.

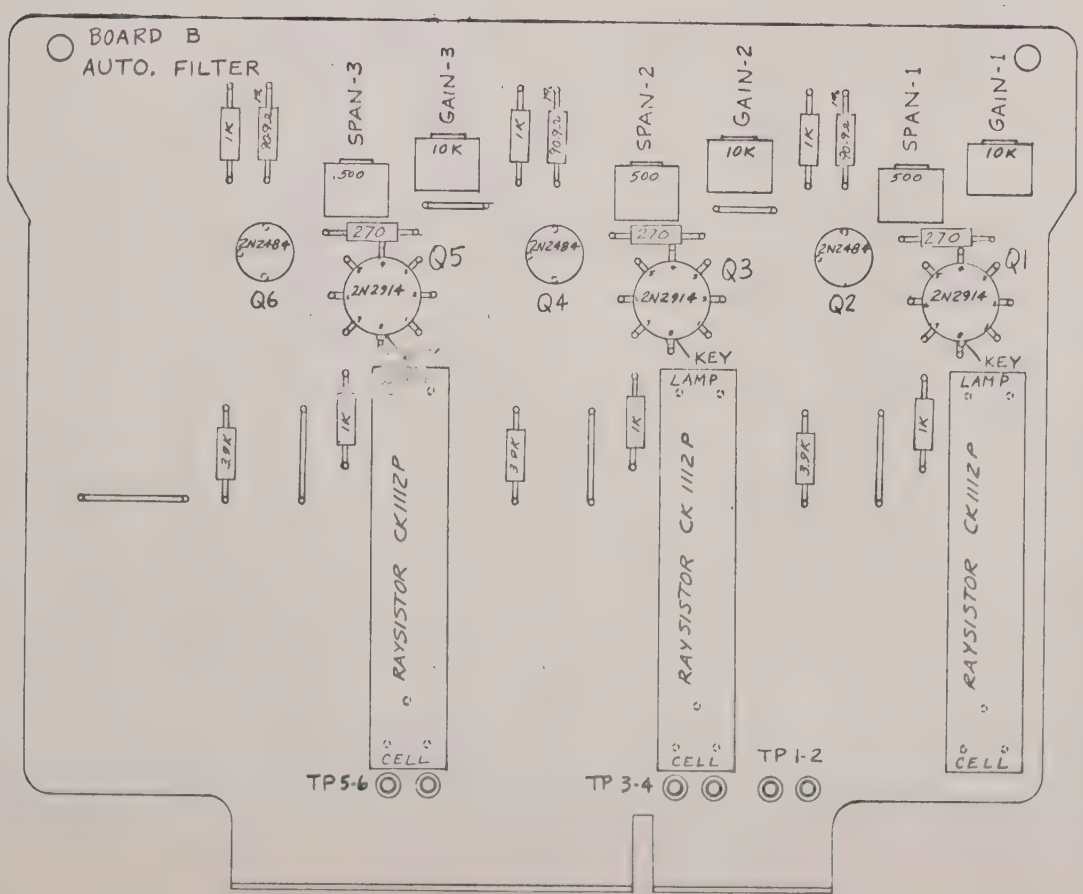
MODEL ACS-6

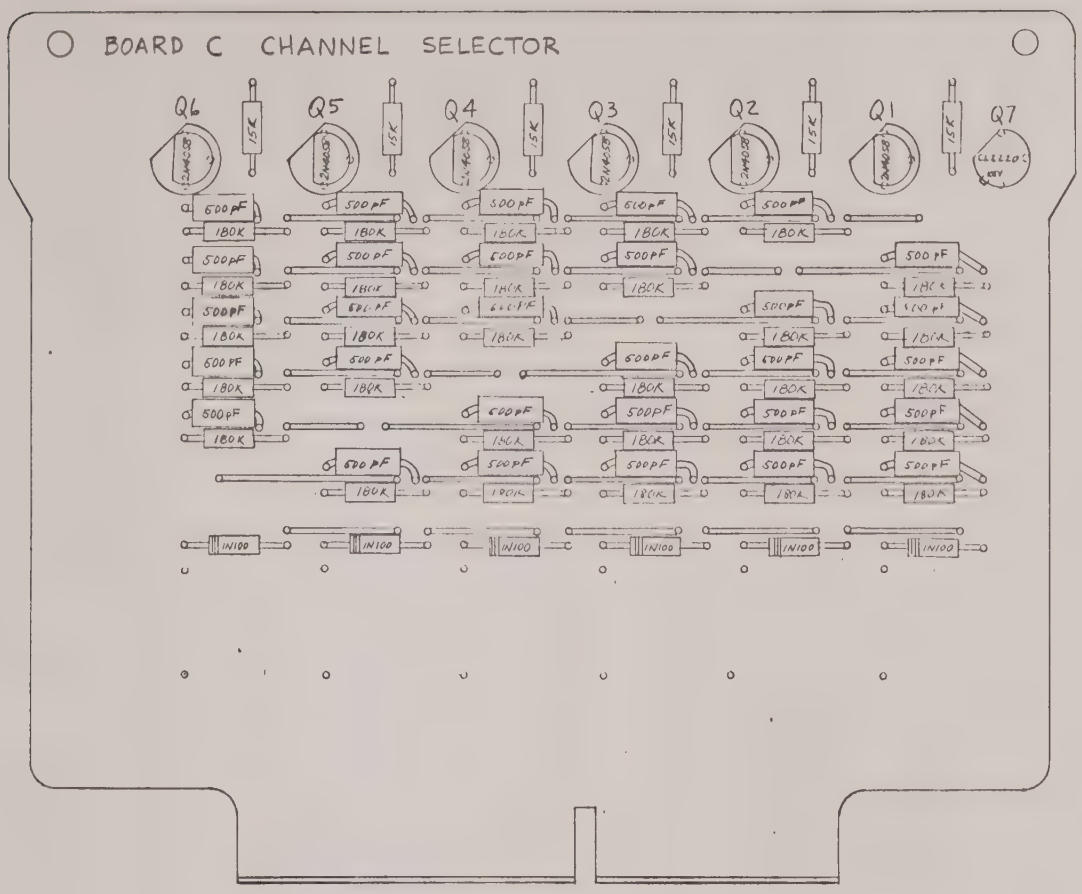
DC Voltages

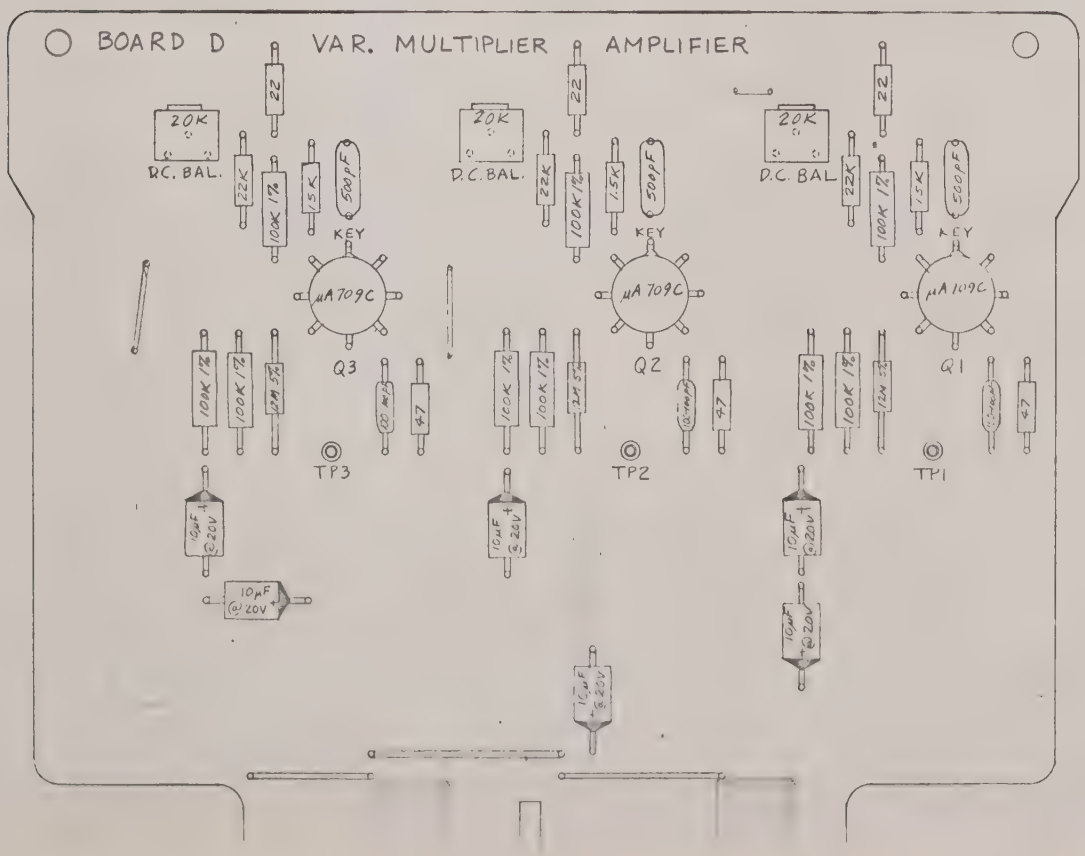
Plug In Boards

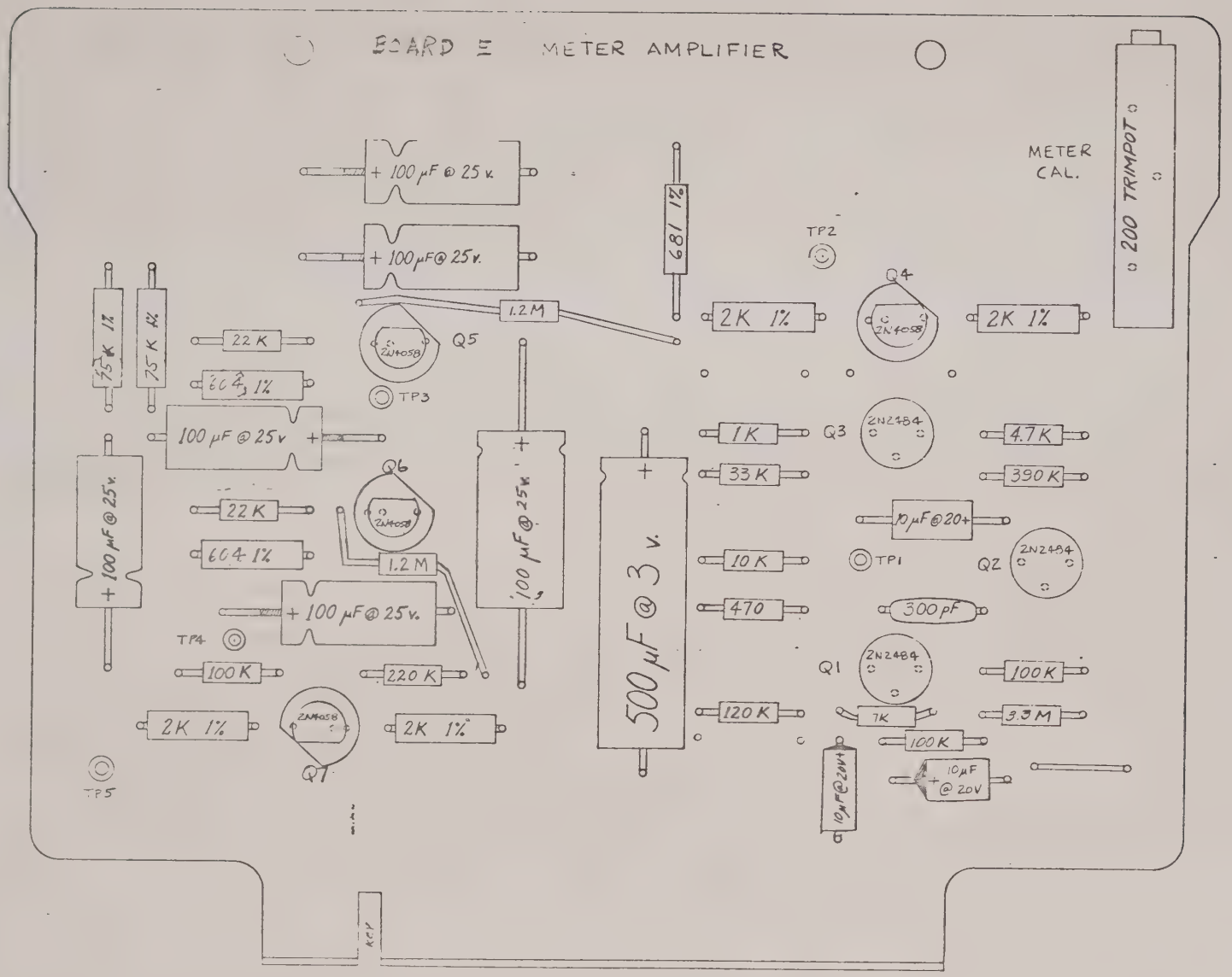
TERMINAL OR TEST POINT	B O A R D				
	(Each Board) A	(Each Board) B	C	D	E
1	+47	Var	+15	0 to +.5	+20
2	0	Res	-8 or+.15		
3			0 to +8	0	0
4	GND	Var	-8 or+.15	GND	
5		Res.	0 to +8	0 to +.5	
6			-8 or +.15		
7	-8 or +.15		0 to +8		GND
8	+6 or +.15			0	
9	0			GND	
10	+15				
11			-8 or+.15	0 to +.5	
12			0 to +8		
13		Var.	-8 or +.15		
14	0 to 8	Res.	0 to +8	0	0 to 1V
15	0 to 8	+9	GND	GND	
16		0 to +1	-8 or +.15	-15	
17		GND	0 to +8	+15	
18	-15	-9	-15	GND	
TP1	7 - 10	Var,Res	-	Signal	7 - 10
TP2	33 - 35		-	Signal	4 - 6
TP3	-	Var.Res.	-	Signal	+20
TP4	-		-	-	+20
TP5	-	Var.Res.	-	-	+4 - 6
TP6	-		-	-	-

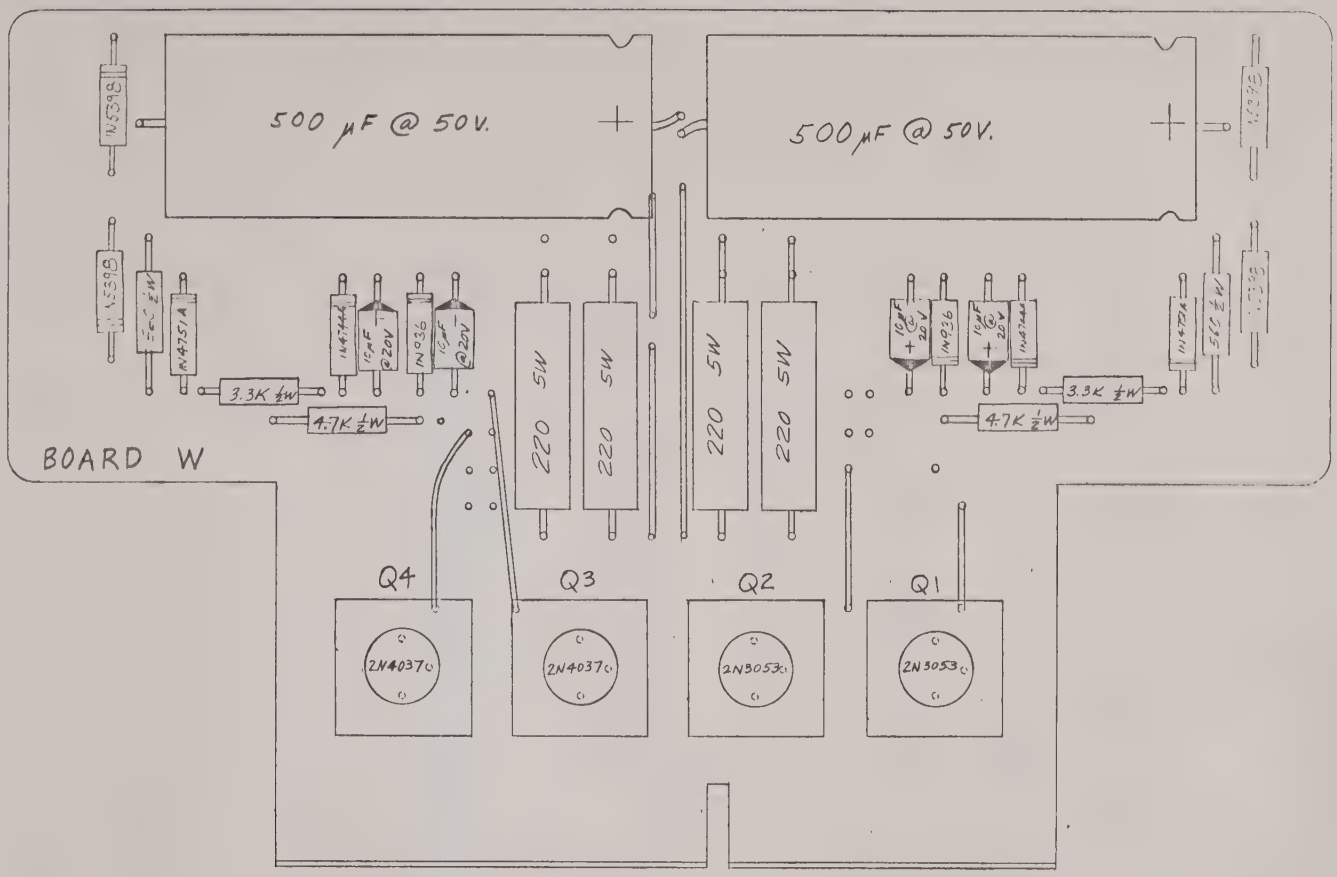

BOARD A
CONTROL AMPLIFIER
GAIN 2
SPAN
2K
2K
10K
.22μF @ 50V.
Q7
Q5
CL2220 KEY
2N4058
1.2K
10K
Q8
Q6
2N3437
2N2484
Q10
3.9K
10K
47K
47K
OFF-SET
5K
47K
+ 22μF @ 50V.
+ 22μF @ 50V.
IN100
IN100
IN100
IN100
GAIN 1
2K
Q4
2N2484
TP2
2.32K 1%
4.32K 1%
Q3
2N2484
2.2K
22K
47K
470K
.047μF @ 200V.
+ 8.2μF @ 40V
CURRENT
5K
47K
Q9
2N2914
KEY
10K 1%
100K 1%
10K 1%
560K
499K
10K
10K
500 μF @ 3V.
TP1
2N2484
Q2
200pF
Q1
2N2484
270K
Q11
2N3458
10μF @ 20V
100K
1K
3.9M
Q12
2N388A
10μF @ 20V
100K

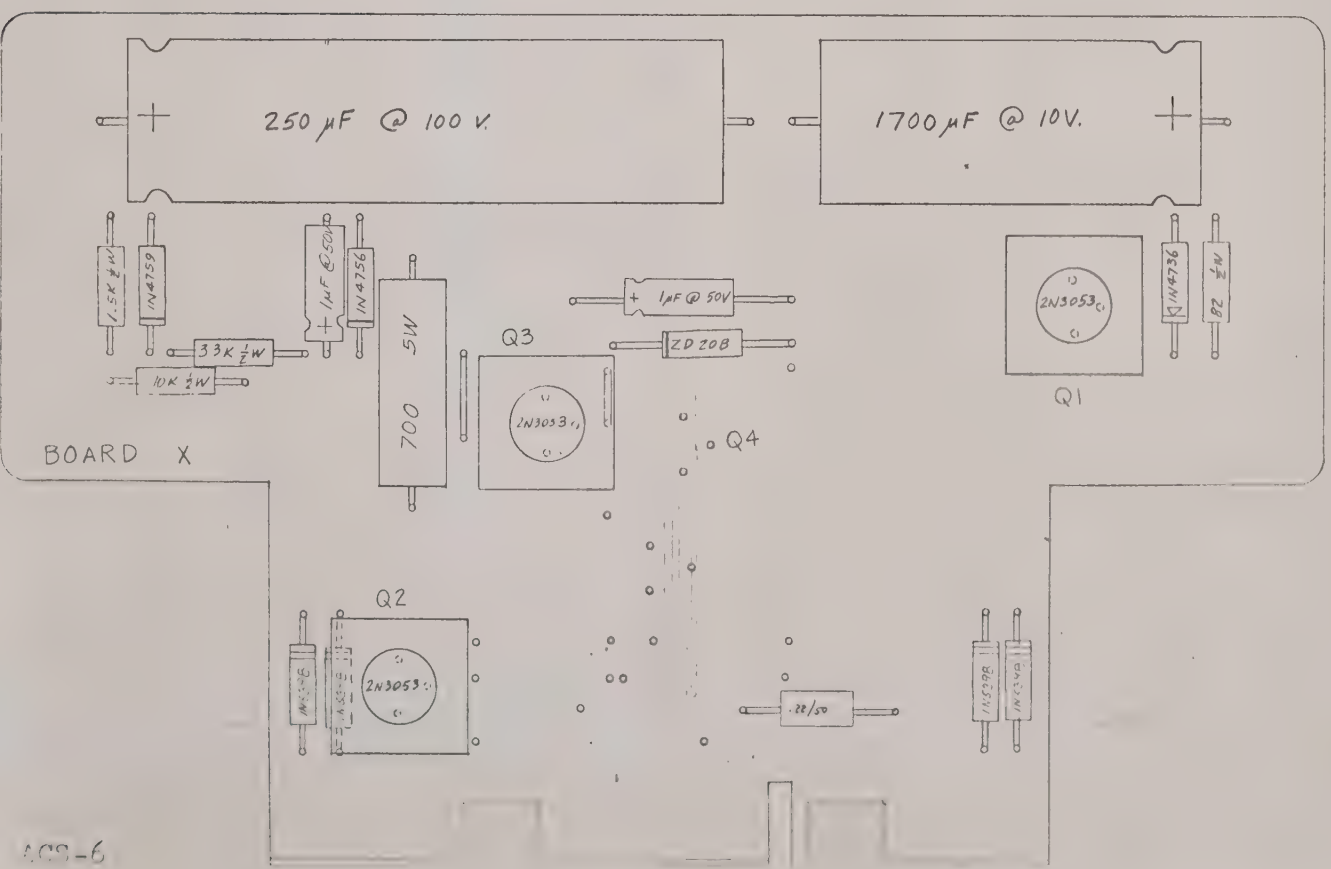

BOARD B
AUTO. FILTER
SPAN-3
GAIN-3
SPAN-2
GAIN-2
SPAN-1
GAIN-1
1K
2.92
500
10K
270
2N2484
Q6
2N2914
Q5
Q4
Q3
Q2
Q1
KEY
LAMP
3.9K
RAYSISTOR CK1112P
CELL
TP5-6
TP3-4
TP1-2

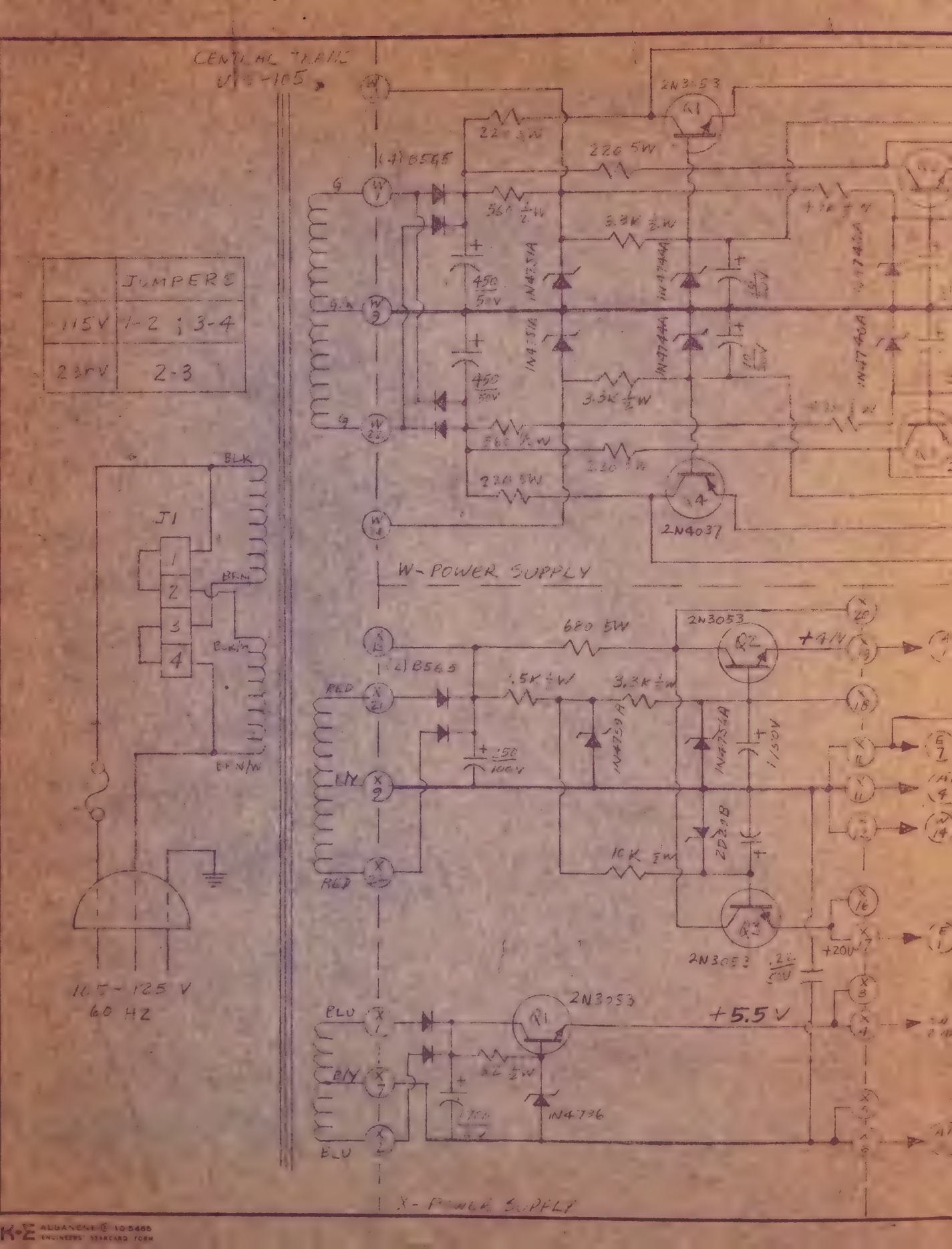

BOARD C CHANNEL SELECTOR
Q6
Q5
Q4
Q3
Q2
Q1
Q7
15K
500PF
180K
IN100

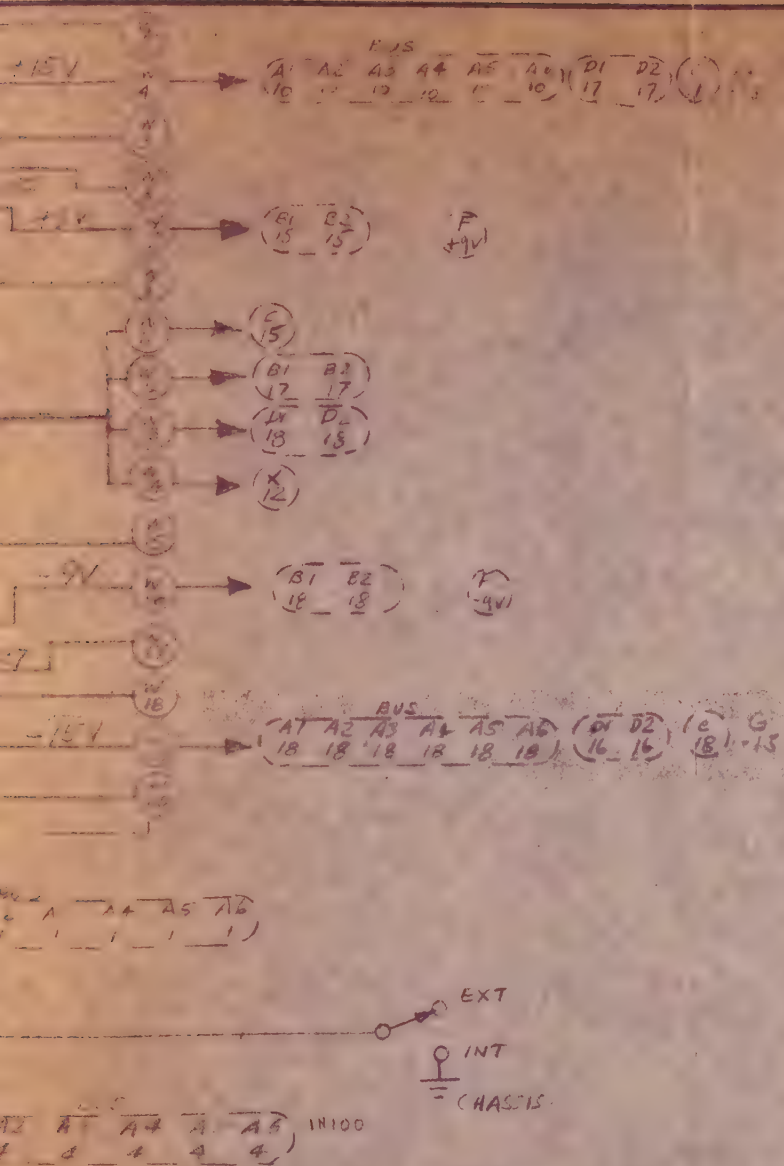

BOARD D VAR. MULTIPLIER AMPLIFIER
20K
D.C. BAL.
22
22K
100K 1%
1.5K
500PF
KEY
μA 709C
Q3
Q2
Q1
100K 1%
12K 5%
47
TP3
TP2
TP1
10μF @ 20V


BOARD E METER AMPLIFIER
METER CAL.
200 TRIMPOT
+ 100 µF @ 25 v.
+ 100 µF @ 25 v.
681 1%
1.2 M
2K 1%
2K 1%
TP2
Q4
2N4058
Q5
2N4058
TP3
75 K 1%
75 K 1%
22 K
604 1%
100 µF @ 25 v
+ 100 µF @ 25 v.
+ 100 µF @ 25 v.
100 µF @ 25 v.
500 µF @ 3 v.
1K
33 K
Q3
2N2484
4.7K
390 K
10 µF @ 20+
TP1
Q2
2N2484
10 K
470
300 pF
Q6
2N4058
22 K
604 1%
1.2 M
TP4
100 K
220 K
Q1
2N2484
100 K
120 K
7K
3.3 M
100 K
10 µF @ 20V
10 µF @ 2N1
2K 1%
2K 1%
Q7
2N4058
TP5


500 μF @ 50V.
500 μF @ 50V.
1N5398
1N5398
1N5398
1N5398
1N4751A
3.3K ½W
4.7K ½W
1N4744
15μF @ 20V
1N936
15μF @ 20V
220 5W
220 5W
220 5W
220 5W
15μF 25V
1N936
15μF 25V
1N4744
3.3K ½W
4.7K ½W
1N4728A
1N5398
BOARD W
Q4
Q3
Q2
Q1
2N4037
2N4037
2N3053
2N3053


250 μF @ 100 V.
1700 μF @ 10V.
1.5K ½W
1N4759
33K ½W
10K ½W
1μF @ 50V
1N4756
700 5W
Q3
2N3033
1μF @ 50V
ZD 20B
Q4
2N3053
1N4736
2.2 ½W
Q1
BOARD X
Q2
2N3053
1N5398
1N5398
.22/50


CENTRAL TRAIN
W6-105
JUMPERS
115V 1-2 ; 3-4
230V 2-3
J1
BLK
BRN
BLK/W
BRN/W
105-125 V
60 HZ
2N3053
2N4037
1N4736A
1N4744A
1N4746A
W-POWER SUPPLY
680 5W
1.5K 1/4W
3.3K 1/4W
1N4739A
1N4753A
2D2.0B
10K 1/4W
+4V
+20V
+5.5V
82 1/2W
1N4736
X-POWER SUPPLY



DATE	SYM	REVISION RECORD	AUTH.	DR.	CK.

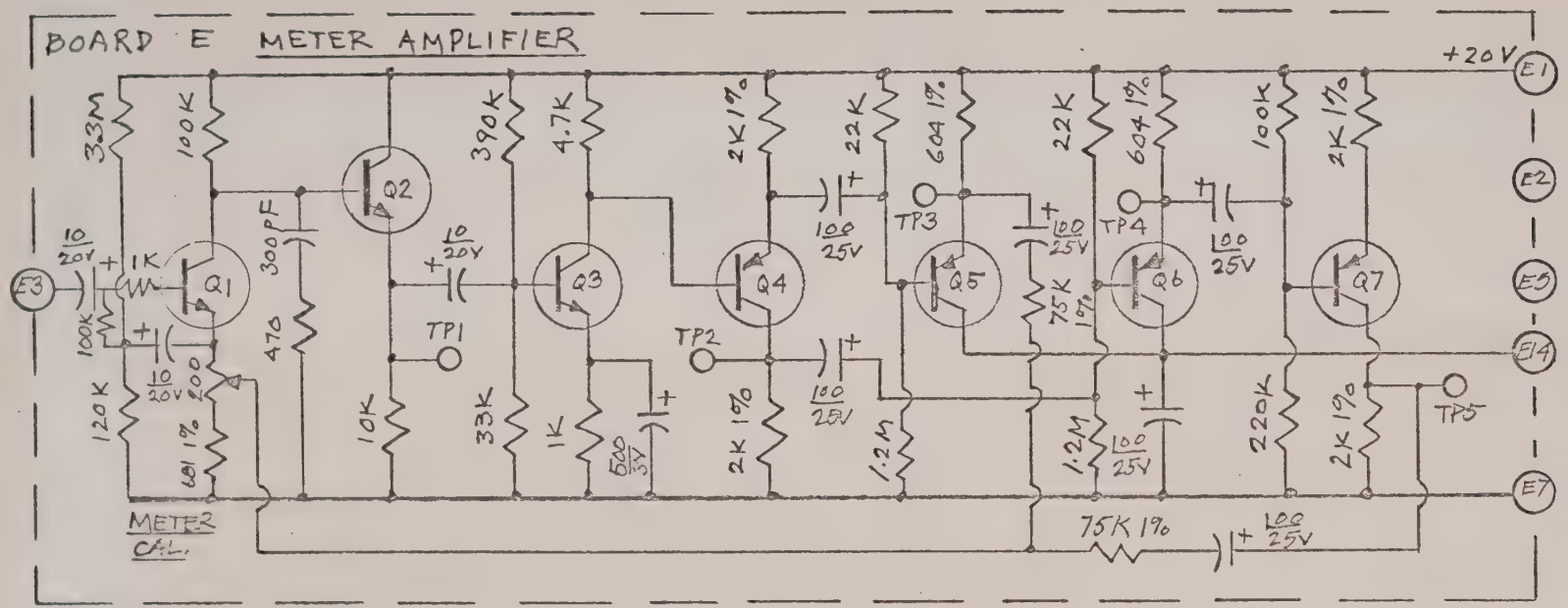
VOLTAGES

TERM.	X	W
1 A	7 (AC)	31 (AC)
2 B	7 (AC)	30
3 C	+5.5	15
4 D	+5.5	15
5 E	-.3	39>25>15
6 F	-.3	1
7 H	-.3	9
8 J		39>25>9
9 K	PWR GND	
10 L	GND.	
11 M	GND	GND
12 N	GND.	GND.
13 P	25	GND
14 R		GND.
15 S		-9
16 T	20	-9
17 U	20	-39>22>-9
18 V	47 B1	-15
19 W	47 E	-.5
20 X	>47 C	39>25>15
21 Y	65 (AC)	-30
22 Z	65 (AC)	31 (AC)

TOLERANCES (EXCEPT AS NOTED)	UNHOLTZ-DICKIE CORP.		
DECIMAL ±	E	SCALE	DRAWN BY TO
			APPROVED BY
FRACTIONAL ±	TITLE POWER SUPPLY SCHEMATIC MODEL MC-6		
ANGULAR ±	DATE 7-8-68	DRAWING NUMBER E7859	

MADE IN U.S.A. 27127

DATE	SYM	REVISION RECORD	AUTH.	DR.	C



Q1, Q2, Q3 2N2484
Q4, Q5, Q6, Q7 2N4058

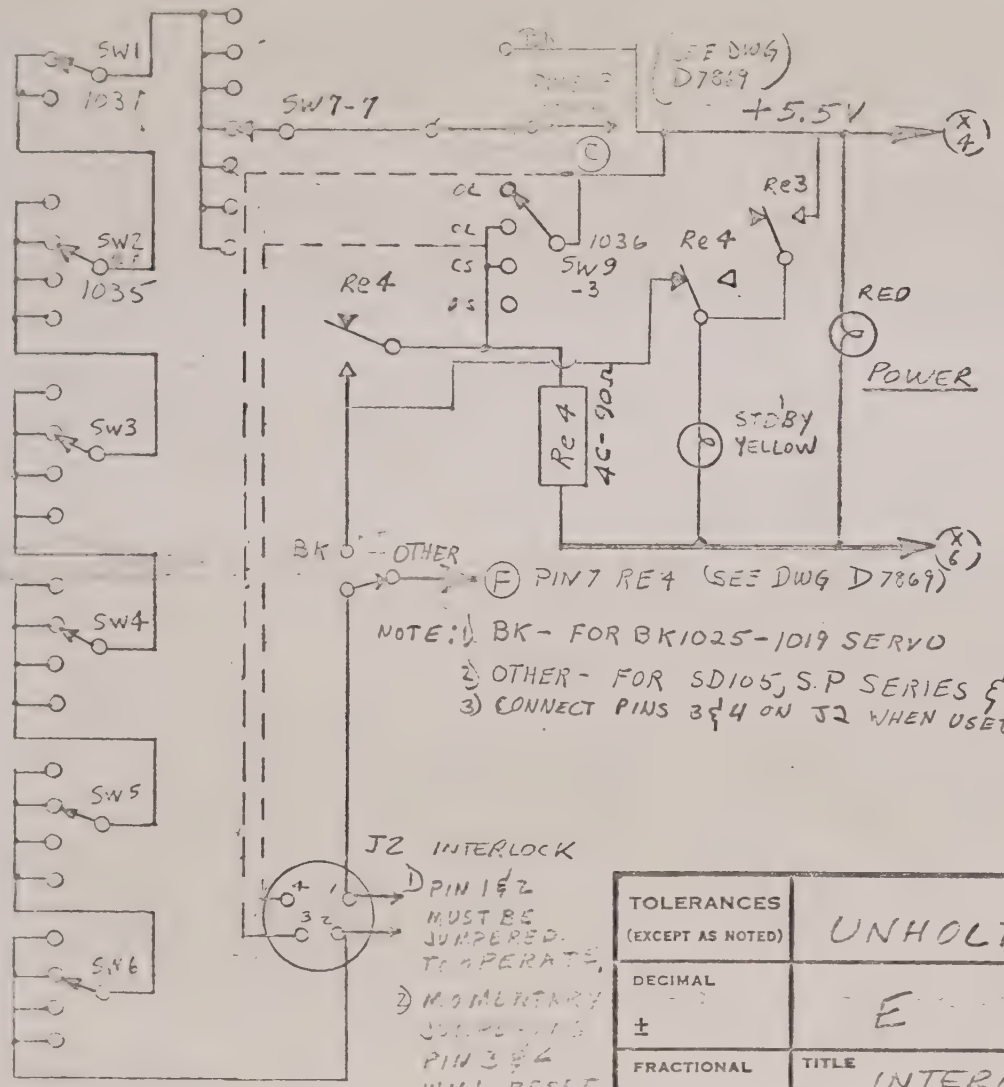
TOLERANCES (EXCEPT AS NOTED)	UNHOLTZ-DICKIE CORP.		
DECIMAL ±	E	SCALE	DRAWN BY
			APPROVED BY
FRACTIONAL ±	TITLE METER AMP BOARD E MODEL ACS-6		
ANGULAR ±	DATE	DRAWING NUMBER A7864	

K·E ALBANENE ® 10 5465 ENGINEERS' STANDARD FORM

MADE IN U.S.A. 25350

DATE	SYM	REVISION RECORD	AUTH.	DR.	CK.
10/5/	A				
	B				

ALL BREAK-BEFORE-MAKE CONTACTS



NOTE: 1) BK - FOR BK1025-1019 SERVO
2) OTHER - FOR SD105, S.P SERIES & LING SERVO
3) CONNECT PINS 3 & 4 ON J2 WHEN USED WITH B & K

TOLERANCES (EXCEPT AS NOTED)	UNHOLTZ - DICKIE CORP		
DECIMAL ±	E	SCALE	DRAWN BY T.U.
			APPROVED BY
FRACTIONAL ±	TITLE INTERLOCK CIRCUIT MODEL ACS-6 SER		
ANGULAR ±	DATE 9-3-68	DRAWING NUMBER A7870	

ALBANENE 10 5465
ENGINEERS' STANDARD FORM

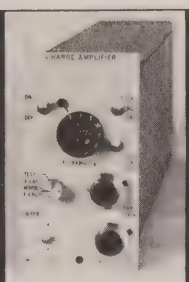
UNHOLTZ-DICKIE CORPORATION

vibration generation systems and measurement instruments

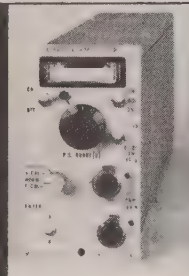
Signal conditioning amplifiers for shock and vibration monitoring

This popular series of signal conditioning amplifiers features individual double shielded power supplies, a totally-enclosed-vinyl-clad case, portability of separate units, ultra low noise levels, frequency response to 100 kHz, and switchable low pass filters with an 18 dB/octave attenuation rate. They can be operated in the integral charge mode with direct connection to the piezoelectric transducer, or switched to the remote preamp mode for operation with either the two-wire charge type remote preamp or the two-wire voltage type remote preamp. Full scale ranges of .1 g to 10 Kg with accelerometer sensitivities from 1 pC/g to 100 pC/g are standard. Also offered is Option III full scale ranging to provide an extra gain of 10 for very low level measurements. Panel height is only 5¼ inches when standard edgewise meters are selected.

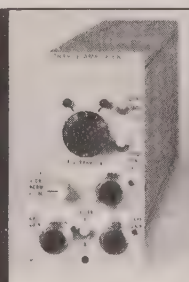
D11V SERIES



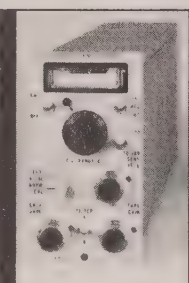
Model D11V
Tape output only
$525.00



Model D11MV
Tape and meter
$575.00



Model D11GV
Tape and galvo
$590.00



Model D11MGV
Tape, galvo, meter
$640.00

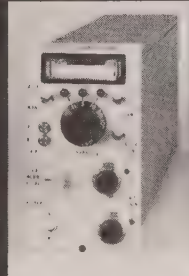
Basic D11V series permits operation with grounded transducers while eliminating usual ground loop problems. Differential circuitry provides rejection of common-mode signals by a factor of 1000. The two-wire remote preamps shown below can be used with any of the D11V series instruments.

OPTIONAL FEATURES

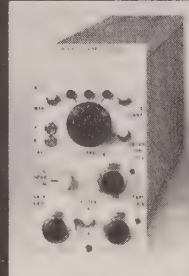
L	Log dc output with 60 dB dynamic range (requires meter feature) $175.00
S	Normalized 10 mV/g servo output for full scale ranges up to 300 g $50.00
0	1 kHz fixed amplitude, sine wave, internal calibration oscillator $50.00
—8	Large meter with 2½ inch scale length and 8¾ inch panel height $20.00
—2	Extended low frequency response flat within ±5% down to 0.5 Hz $25.00

AUTORANGER SERIES

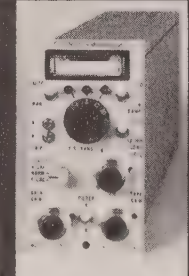
Model 811M
Range restorer
$1200.00



Model 11MAV
Tape and meter
$745.00



Model 11GAV
Tape and galvo
$760.00



Model 11MGAV
Tape, galvo, meter
$810.00

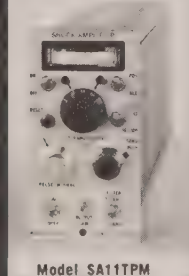
AUTORANGER series selects best of 3 adjacent full scale ranges. Pilot light and dc code signals indicate range selected. Range sequences of 1, 3, 10 . . ., or 10 dB steps, or 1, 10, 100, 1K are offered. Companion RANGE-RESTORER converts tape recorded data to original dynamic range. The two-wire remote preamps shown below can be used with any of the AUTORANGER instruments.

OPTIONAL FEATURES

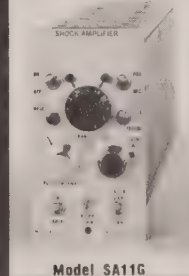
S	Normalized 10 mV/g servo output for full scale ranges up to 1 Kg $50.00
0	1 kHz fixed amplitude, sine wave, internal calibration oscillator $50.00
F	Linear DC output for amplifiers supplied with meter feature $25.00
—8	Large meter with 2½ inch scale length and 8¾ inch panel height $20.00

SHOCK SERIES

Model 11TPM
Transient peak meter
$350.00



Model SA11TPM
Shock amplifier with tape and transient meter
$875.00



Model SA11G
Shock amplifier with adjustable galvo output
$615.00

Model SA11MG
Shock amplifier with galvo, and standard meter
$665.00

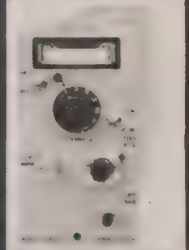
Shock amplifiers have selectable low and high frequency time constants for pulse durations from 100 microsec to 100 millisec. Reset feature and direct coupling provide rapid stabilization. Series shown at left can be intermixed with other series 11 instruments. Series described below are housed in a single portable carrying case that can be rack mounted as one, two or three units.

PORTABLE SHOCK INSTRUMENTS

Model SA11GO-3	Portable shock amplifier with galvo and internal oscillator
Model 11TPM-3	Portable transient peak meter for pulse measurements
Model 11RA-3	Rack adapter for 1 to 3 of the portable units above.

OPTIONAL FEATURES

1 kHz Osc. $50.00 10 mV/g Servo $50.00

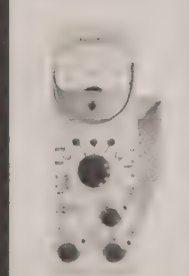


Model V11MS $475.00
Tape, meter, servo
Economy model operates exclusively with two-wire remote charge or voltage preamp shown at right

Galvo option $65.00
OSC option $50.00

Model 11CA-2 $90.00
Remote charge preamp
Will operate with any series D11V or Autoranger instrument.

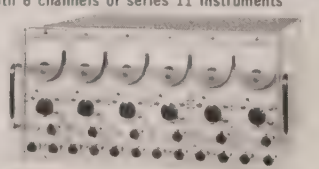
Model 11PA-2 $50.00
Remote voltage preamp
Will operate with any series D11V or Autoranger instrument.



Series 11 instrument with —8 meter option.

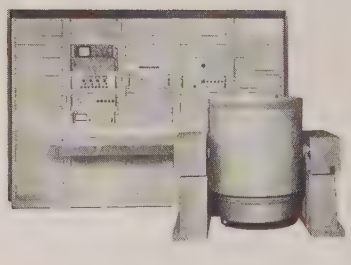
Model 11P-2 $70.00
Dual channel Portable adapter
With 2 channels of series 11 instruments

Model 11RA Rack Adapter $150.00
With 6 channels of series 11 instruments

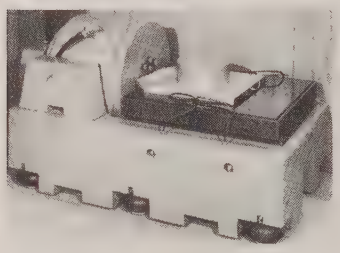


Model 11RA-8 Rack Adapter $175.00
With 6 channels of series 11 instruments with —8 meter options

Complete vibration test systems



15000 lb system with solid state amplifier



Shaker and slip table on seismic base

SYSTEM	SYSTEM	SHAKER TABLE					SYSTEM COOLING		
								SHAKER	
Model Number	Force Sine lbs.-pk	Stroke inches pk-pk	Bolt Circle Max. Dia.	Suspension Stiffness lbs/in.	Weight lbs.	Frequency Range - Hz	Amplifier	Moving Element	Field
TA 100-4	150	4	—	Nil	3	dc-1000	Air	Air	Air
TA 250-6	1000	6	—	Nil	11	dc-1000	Air	Air	Air
TA 50-20	200	1	3.5	80	2	dc-3000	Air	Air	Air
72-7	200	1	4.5	225	4	5-10000	Air	Air	Air
TA 250-100	350	1	4.5	225	4	dc-6000	Air	Air	Water
76-7	350	1	4.5	225	4	5-10000	Air	Air	Water
340-7	350	0.5	2.25	50	2.5	5-10000	Air	Air	Water
279	450	1	4.5	225	5.3	5-5000	Air	Air	Water
TA 161	1000	1	5.75	250	14	dc-2000	Air	Air	Air
262-8	1200	1	8	400	20	5-3000	Air	Air	Air
464-8	1700	1	8	400	20	5-3000	Air	Air	Air
8160-8-20	2000	1	8	400	20	5-3000	Air	Air	Air
8160-20	2000	1	5.75	250	14	5-2000	Air	Air	Air
454	1750	1.25	8	600	20	5-3000	Air	Air	Air
484H	2000	1.25	8	600	20	5-3000	Air	Air	Air
8208 AAA	2600	1.25	8	600	27	5-5000	Air	Air	Air
8208 AMA	3000	1.25	8	600	20	5-3000	Air	Air	Air
8208 PH	3000	1.25	5.75	300	14	5-2000	Air	Air	Air
8208 CMV	3800	1.25	8	600	26	5-2000	Air	Air	Water
691M-50	5000	1.25	12	1200	34	5-3000	Air	Air	Air
1596M-60	6000	1.25	12	1200	34	5-3000	Air	Air	Water
TA 1696M-60	6000	1.25	12	1200	36	dc-3000	Water	Air	Water
TA 1600M-80	8000	1.25	16	3000	90	dc-3000	Water	Air	Water
TA 3200M-100	10000	1.25	16	3000	90	dc-3000	Water	Air	Water
TA 13500-120	12000	1.25	16	3000	90	dc-3000	Water	Air	Water
TA 16400-150	15000	1.25	16	3000	75	5-3000	Water	Air	Wtaer

Systems with TA in model number include all silicon, direct coupled, solid state power amplifiers.

MULTIPLE SHAKER SYSTEMS FOR LARGE LOADS, HIGH FORCE RATINGS, OR SPECIAL APPLICATIONS ARE AVAILABLE

Accessory instruments

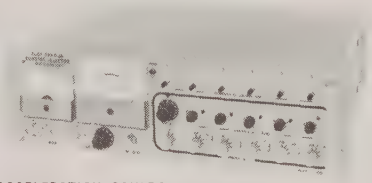
Shaker system controls and protective functions

MULTIFUNCTION AVERAGING CONTROL
Model MAC-6C

Features: Phase insensitive averaging for at least 6 inputs ■ Allows averaged shaker system control for sine and random tests ■ Sine tests: absolute average of output yields average of input magnitudes ■ Random tests: spectral density of output yields average of input spectral densities ■ Freedom from detector time constant problems ■ DC output for recording ■ Units may be coupled for more than 6 inputs

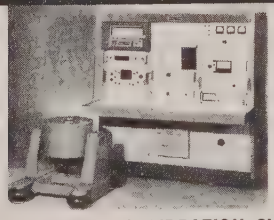
SERVO PROGRAMMERS
Models SP5 and SP2

Features: Combines functions of amplitude servo and vibration programmer in one instrument ■ Programmer contains up to five program segments with servo controlled acceleration, velocity or displacement selectable for each segment (SP5) ■ Simplified closed-loop presetting of vibration levels before actual test is performed ■ Optional safety shutdown at pre-set level of acceleration ■ Solid state, plug-in, printed circuit construction ■ Log dc output for X-Y recording of test



ACCELERATION CONTROL SELECTOR
Model ACS-6
Solid State Switching

Features: Automatically switches to highest (or lowest) accelerometer for amplitude servo control ■ Up to 6 input acceleration signals ■ Switching speed continuously variable with frequency ■ Weighted switching from .01 to 10 times nominal acceleration ■ Wide dynamic range ■ Pilot light indicates controlling channel.



Calibration systems for accelerometers

AUTOMATIC CALIBRATION SYSTEMS

Unholtz-Dickie automatic calibration systems, based on Model 106A shaker automatically plot accelerometer calibration curves of charge or voltage sensitivity vs. frequency to any level up to 100 g and 10 kHz. Original data is permanently plotted — eliminating operator error in readout and transcription. Continuous curve detects all variations, expansion or compression of vertical scale for optimum accuracy and readability of curves. One per cent accuracy of unknown accelerometer relative to reference.

ABSOLUTE CALIBRATION OPTICAL SYSTEM

Model DO-5000. New optical instrument gives digital readout of absolute displacement.

Piezoelectric accelerometers

Micro-miniature
0.8 grams

General purpose
high sensitivity

For accurate vibration measurements this D21 series of shear mode types insure freedom from case sensitivity and lowest cross axis sensitivity. A range of sizes covers most applications, down to a 0.65 gram sub-miniature model. This series uses Lead Ziconate-Titanate crystals. Also available are Bismouth composition crystals for high temperatures.

Complete information is available on all products. Write to Unholtz-Dickie.

UNHOLTZ-DICKIE CORPORATION

3000 Whitney Avenue, Hamden, Connecticut 06518

Printed in U.S.A.

Area Code (203) 288-3358

Bulletin IB-70S

UNHOLTZ-DICKIE CORPORATION

vibration generation systems and measurement instruments

MODEL ACS-6 ACCELERATION CONTROL SELECTOR
AUTOMATICALLY SWITCHES TO THE HIGHEST (OR LOWEST) ACCELERATION INPUT

FEATURES

- Universal instrument operates with any servo
- Accepts 6 acceleration signals and gates to the output whichever acceleration signal reaches its preset limit
- Units may be connected in series to allow selection from any number of acceleration signals.
- Two modes allow limiting acceleration at 6 points to be less than or alternately greater than preset levels
- Pilot light indicates channel in control
- Solid-state switching
- Switching speed varies continuously with frequency for optimum response
- Switching detection time always faster than servo response time
- Weighting of selection level on channels two through six continuously adjustable from 10 times to 0.01 times channel one acceleration level.
- Calibrated ten turn locking dials set and indicate the weighting factor
- Wide dynamic range: With unity weighting, noise level is less than .03 g. Maximum input 1000 g.
- Large accurate vibration meter switchable to monitor any channel
- DC output (single ended) for recording metered channel
- Panel switch controls affecting vibration level interlocked to put servo in Standby when changed during operation
- Internal calibration signal provides check of instrument operation and presetting of controls prior to shaker operation
- Compatible with MAC-6C Six Channel Averaging Control connected to any input channel
- All solid-state with plug-in PC card construction

GENERAL

The Model ACS-6 Acceleration Control Selector is a device for automatically selecting one acceleration signal from as many as six input acceleration signals for amplitude servo control of sine vibration tests. The all solid-state unit gates the selected signal to its output corresponding to the input of the servo. See block diagram Fig. 1.

Multiple accelerometers mounted at a number of points on a resonant test item experience changes in relative acceleration magnitudes as the operating frequency is changed. If only one accelerometer were used and its acceleration magnitude was maintained at a constant level by the amplitude servo, wide variations in acceleration magnitude would be experienced at the other accelerometer locations. The ACS-6 can be used to switch control to an accelerometer which otherwise would exceed an arbitrary upper limit of acceleration. An example using two accelerometers only is shown in Figure 2. Channel 1 is set to control at 5 g pk, while Channel 2 is set to limit at 10 g pk. Channel 2 could have been set to control at 5 g pk also if preferred, in which case Channel 1 would have been reduced to half the value shown at 370 Hz, the resonant frequency of Channel 2. Up to 6 channels of control could be used simultaneously. Two are illustrated for reasons of simplicity.

Two operating modes are provided. A switch selects the "largest" or the "smallest" operating mode. In the "largest" mode, the ACS-6 switches to the acceleration input channel which rises to its preset value of acceleration, all other channels being below their limiting preset values. In the "smallest" mode, the ACS-6 switches to the acceleration input channel which falls to its preset value of acceleration, all other channels being above their limiting preset values.

The time required for determining that switching should take place as well as the time to actually switch must be held to an absolute minimum to limit overshoot or undershoot of acceleration magnitude at the time of accelerometer switching. Solid-state switching in the ACS-6 avoids the time lag of mechanical relays. The detection speed used to trigger switching is continuously varied as a function of operating frequency to the optimum value. This results in a switching speed equal to or faster than the amplitude servo response time which in turn is limited by added distortion or by the test item resonance causing amplitude instability (hunting).

Selection of the largest or smallest acceleration signal from a group of more than six is also possible. The output of one ACS-6 can be used as one input to a second unit to provide selection from 11 signals. Likewise, additional units may be connected in series to allow selection from any number of signals.

APPLICATIONS

The ACS-6 Acceleration Control Selector has application for vibration sine testing to avoid over-testing, to limit the maximum value of acceleration on a resonant component, to protect against loss of control accelerometer signal and to limit cross axis acceleration. A test may be conducted with all of these forms of control and protection operating simultaneously.

The foregoing applications would use the "largest" mode of operation on the ACS-6. By switching to the "smallest" mode of operation, under-testing would be avoided in accordance with MIL-STD-810B dated 15 June 1967, paragraph 5.4, page 514-8.

a. Over-test Protection

If due to the size and/or resonances in a test item, it becomes impossible to obtain equal motions at all input attaching points through the test frequency range, over-testing can be avoided by using the ACS-6. One accelerometer is mounted at each input point on the item. Whenever one accelerometer exceeds the acceleration magnitude of all the others, it automatically takes control suppressing the acceleration magnitudes at the other points. In this case, all accelerometers control to the specification acceleration when in control and all channels are set to a multiplier factor of unity. See instrument front panel.

b. Maximum Acceleration Limit

Occasionally a component must be mounted in a larger assembly where at particular operating frequencies the vibration level greatly exceeds the vibration level at the input to the assembly. The designer may wish to limit the acceleration level seen by the component. This can be done by mounting an accelerometer on the component in question, in addition to the accelerometers attached to the vibration input points of the assembly, and connecting it to any channel other than number one of the ACS-6. The limiting value of acceleration, where the accelerometer mounted on the component takes control of the test, can be set to any value from 1 to 10 times the main controlling channel acceleration level. For example, if the test were to be run at 20 g, the component accelerometer channel could be set to limit at any value from 20 to 200 g. (50 g to 500 g if the test were run at 50 g etc).

c. Protection from Loss of Control Accelerometer Signal

By mounting two accelerometers side by side, if one should fail to send its signal to the ACS-6, the ACS-6 would automatically switch to the second for control. Dual accelerometers could be used at more than one mounting location if desired, up to a total of six input accelerometers.

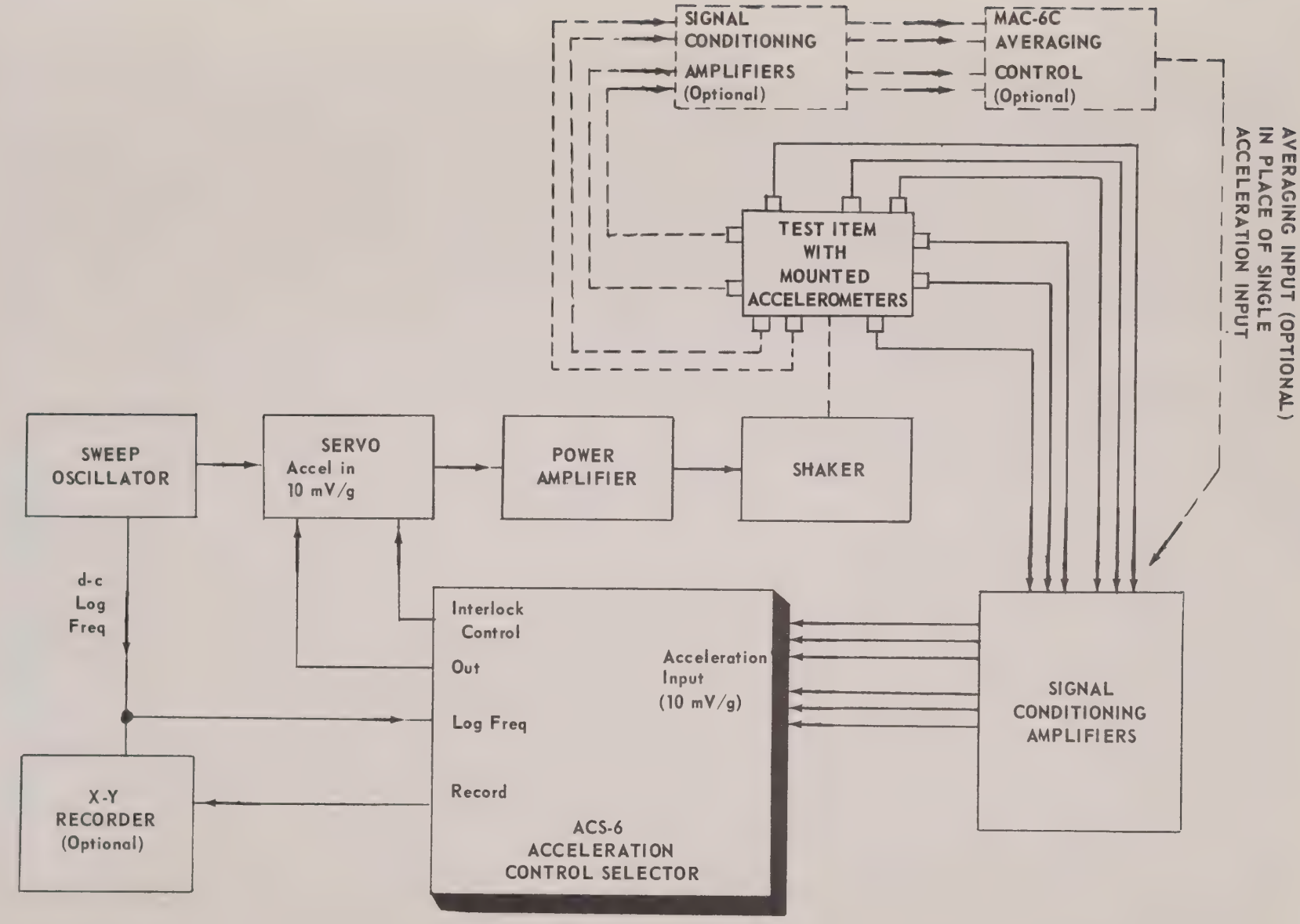


FIG. 1 BLOCK DIAGRAM

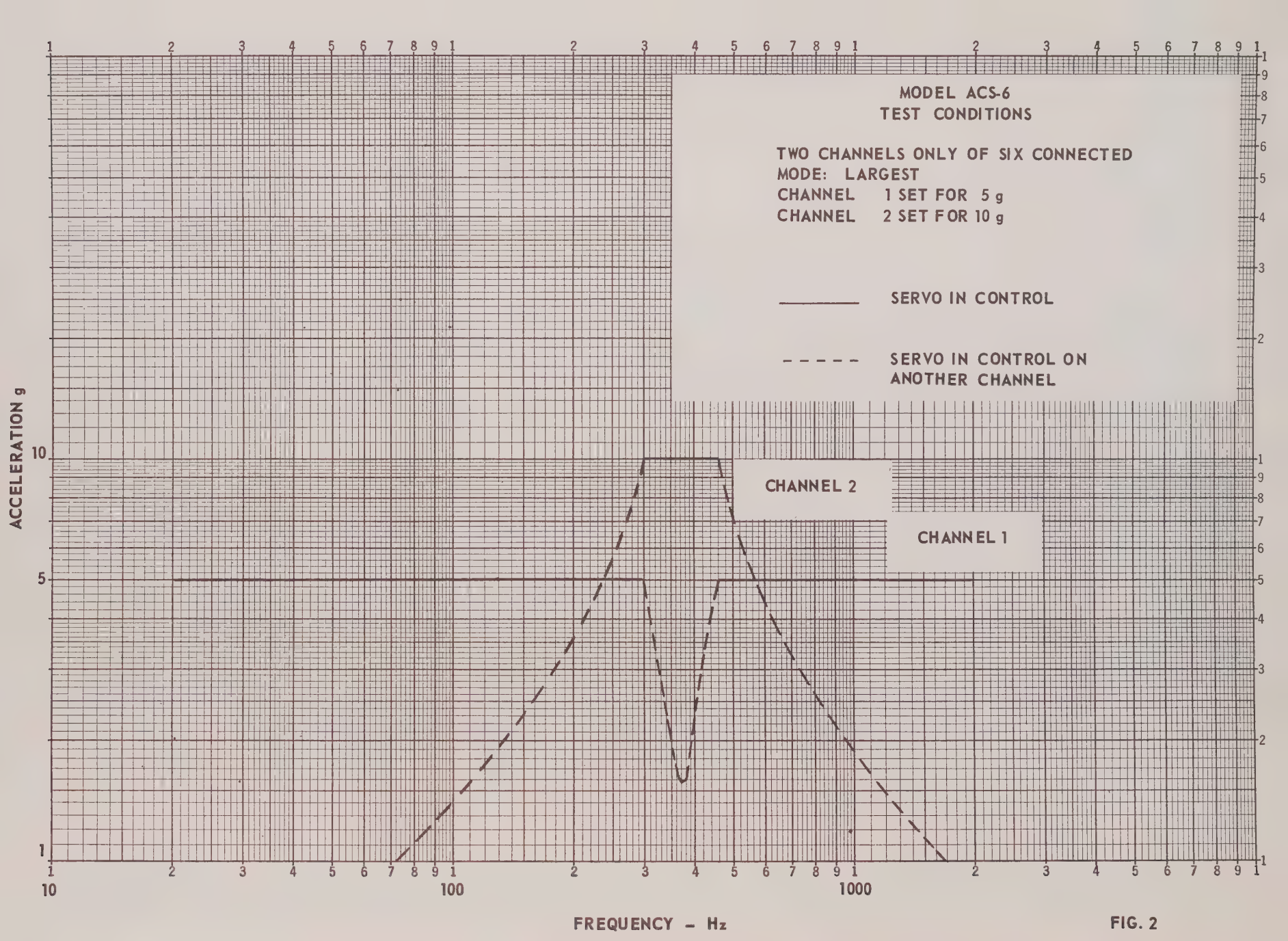

MODEL ACS-6
TEST CONDITIONS
TWO CHANNELS ONLY OF SIX CONNECTED
MODE: LARGEST
CHANNEL 1 SET FOR 5 g
CHANNEL 2 SET FOR 10 g
SERVO IN CONTROL
SERVO IN CONTROL ON ANOTHER CHANNEL
CHANNEL 2
CHANNEL 1
ACCELERATION g
10
5
1
10
100
1000
FREQUENCY – Hz

FIG. 2

APPLICATIONS (Continued)

c. Protection from Loss of Control Accelerometer Signal (Contd.)

This method is preferred because it is direct and operates on the actual acceleration magnitude as compared to other indirect methods which rely on the rate of change of the servo output for shutdown actuation. This indirect method is further complicated by the normal change in servo speed as a function of operating frequency.

d. Cross Axis Acceleration Limit

The ratio of acceleration in any direction normal to the driven direction to acceleration in the driven direction, is intended to be small. Resonant test items may induce unacceptably large values to this ratio. The ACS-6 allows accelerometers to be mounted with their sensitive axis normal to the driven axis. With these cross axis measuring accelerometers connected to any input channel other than number one on the ACS-6, the cross axis acceleration can be limited to any value of the above stated ratio from 1% to 1000%. For example, if the test specification required 20 g in the driven axis, the cross axis acceleration could be limited to any value from 0.2 g to 200 g. If the cross axis acceleration reached the preset value, the cross axis accelerometer would be switched to system control, depressing the acceleration at all other accelerometer locations as required to maintain the limiting acceleration at the cross axis measurement point.

e. Averaging Input

The ACS-6 can be used with the Unholtz-Dickie MAC-6C Averaging Control. Several acceleration channels (up to six) can be connected to the MAC-6C Averaging Control which in turn is connected to one of the channels of the ACS-6 Acceleration Control Selector. See Fig. 1 option.

PRESET CONTROLS

An internal calibration signal is provided allowing all controls to be set to the desired operating and limiting levels prior to operation of the system shaker. The Comparator Input Meter with easy reading scale facilitates setup adjustment.

VIBRATION METER

A precision meter calibrated in g pk units of acceleration with full scale ranges of 1, 3, 10, – – – 1000 continuously monitors the acceleration of any of the six inputs. The channel to be monitored is switch selected. The meter shows a constant acceleration when the channel being monitored has been automatically selected for system control, and the variation in acceleration when another channel has been automatically selected for control. A d-c output corresponding to the meter indication is available for recording.

PILOT LIGHTS

Lighted indicators identify which of the six input channels is selected for system control at any time during system operation. If front panel switch controls, which affect the system vibration level, are inadvertently changed during system operation, the standby pilot will light and system vibration will stop.

SPECIFICATIONS
ACS-6

1.0 Inputs

1.1 Acceleration Signal

1.1.1 Number of Inputs: Six. Any number from two to six shall be usable. Units may be connected in series to allow selection from any number of acceleration signals.

1.1.2 Input Sensitivity:

10 mV pk/g pk

1.2 Frequency Signal

1.2.1 A d-c signal proportional to log frequency shall control switching detection speed

1.2.2 The d-c signal shall vary logarithmically for a frequency range of 5 to 5000 Hz

1.3 Input Impedance: Greater than 100 K ohms – all inputs

2.0 Output Acceleration Signal

2.1 Sensitivity: 10 mV pk/g pk on reference channel and on all other channels when weighting is set for unity

2.2 Gain: Unity. Input gated to output on reference channel and on all other channels when weighting is set for unity. Servo control metering and other instrumentation after the ACS-6 shall remain in calibration without adjustment.

2.3 Impedance: Less than 50 ohm

3.0 Operating Modes

3.1 Control On The Largest:

Whenever the acceleration magnitude in any operative channel shall rise to the preset level for that channel, that channel shall be switched automatically to the output.

SPECIFICATIONS, ACS-6 (Continued)

3.2 Control On The Smallest:

Whenever the acceleration magnitude in any operative channel shall fall to the preset level for that channel, that channel shall be switched automatically to the output.

4.0 Preset Acceleration Levels:

4.1 Reference Channel:

Shall be settable to any acceleration magnitude from 0.3 to 1000 g pk

4.2 Alternate Channels:

Shall be settable by calibrated locking dial to any acceleration magnitude within 0.01 to 10 times the reference channel magnitude except as limited by 0.1 to 1000 g pk. A switch position giving the same acceleration magnitude as the reference channel, independent of the locking dial position, shall also be provided.

5.0 Frequency Response: ±2%, 5 to 5000 Hz each channel

6.0 Dynamic Range: 90 dB based on unity weighting, a noise level of less than 0.03 g and a maximum input of 1000 g.

7.0 Switching Detection Speed:

Continuously variable as a function of operating frequency and optimized for maximum speed of response without "chatter" at the ripple frequency.

8.0 Indication Of Controlling Channel:

By front panel pilot lights

9.0 Preset Controls: An internal calibration signal and set up provisions, shall be included to preset each channel for the desired controlling acceleration magnitude without operation of the vibration shaker.

10.0 Meters:

10.1 Acceleration Meter:

10.1.1 Shall be switchable to any of the six input channels at all times

10.1.2 Full Scale Ranges:

1, 3, 10---1000 g

10.1.3 Meter Scales:

0 to 3 and 0 to 10 mirror backed

10.1.4 Scale length:

3.33 inches

10.2 Calibration Meter: For presetting per paragraph 9.0

10.2.1 Range Switching:

None required

10.2.2 Meter Scale:

Marked for REF-SM, CAL, REF-LG

10.2.3 Scale Length:

2.37 inches

11.0 Output Monitor Voltage:

11.1 Type: D-C output suitable for X-Y Recorder input. 1 volt for acceleration meter full scale value.

11.2 Switching: Any one of the six input channels shall be switch selectable for monitoring, regardless of the channel in control.

12.0 Interlocking: Front panel controls, which can inadvertently abruptly change the shaker vibration, shall be interlocked and cause the system amplitude servo to reduce the vibration to substantially zero if actuated. Pilot shall indicate interlock shutdown.

13.0 Circuitry: All solid-state, including solid-state switching and electro-optical control of switching speed.

14.0 Construction: Printed circuit, plug-in card

15.0 Physical: 5.25 H X 19 W X 12 D

16.0 Input Power: 105-125/210-250 VAC
50 to 60 Hz

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